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Contents: July 1983
Volume VII No. 7

MICROCOMPUTING



Sony and the micro floppy. Page 66



Morrow's choice computer. Page 44

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38 Cover: The C-64 Sounds Off!
A comprehensive look at Commodore-64's music-making capabilities and an introduction to how it generates other sound effects.
By Richard Daley

44 Should You Choose The Micro Decision?
With its features, price and performance, Morrow's new micro is a choice computer.
By F. Derfler and D. Ferrata

48 Zorba the Portable
Telcon Industries' new micro offers not only portability, but also transportability—its disks can be read by a number of other CP/M machines.
By Kenniston Lord

52 A Real-Time System Compiler
Here's a unique hardware/software approach that improves the sometimes difficult relationship between microcomputers and compilers.
By Martin Reiffin

66 Sony's Marketable Micro
With its micro floppies and an assortment of available add-ons, the SMC-70 is Sony's "one and only" micro. By Bruce Kline

70 TS-1000 Printing Power For Under $100
The lowest-priced printer for the lowest-priced micro can do a capable job—and at a fraction of the cost. By Jim Stephens

72 Increasing CP/M Power
If you find CP/M lacking in some areas, this utility program will provide more power to you and your micro. By Mitchell Hobish

74 How to Succeed in Business (with a little help from Apple)
Learn the secret of success in business with this Apple II program that analyzes your company's sales and cost figures. By Gregory Glau

80 Printer Survival Kit
Shhh—the Infoscribe 1000 is printing. It's a heavy-duty, quality printer with the emphasis on quiet!
By Jim Hansen

86 A VIC Printer for the Do-It-Yourselfer
Dust off your ASR33 Teletype and put it to work with your VIC-20. All you need is this simple interface circuit. By George Steber

88 Do-It-Yourself Recorder For the VIC-20
Build this simple cassette interface circuit that lets you use an ordinary recorder with the VIC—and save yourself $70. By Jim Brousseau

90 The Intelligent Toaster
We continue our journey into the world of single-chip intelligence by exploring the programming and use of the Intel 8748.
By Mark Robillard

100 The Pied Piper: Will Computer Users Follow?
STM Electronics is hoping the Pied Piper portable will take after its namesake and entice people away from the competition.
By Kenniston Lord

6 Publisher's Remarks
8th Anniversary Blues

10 PET-pourri
A Tour of Commodore

20 What's New, Big Blue?
A $50 Word Processor

30 Overview
What's Next for Printers?

36 Letters to the Editor

102 Conversions
Heath Check-Writing
and Optimal Programs

118 Micro Software Digest
Software Reviews at a Glance

122 Classifieds

122 Dealer Directory

122 Club Notes

124 Book Reviews

128 New Software

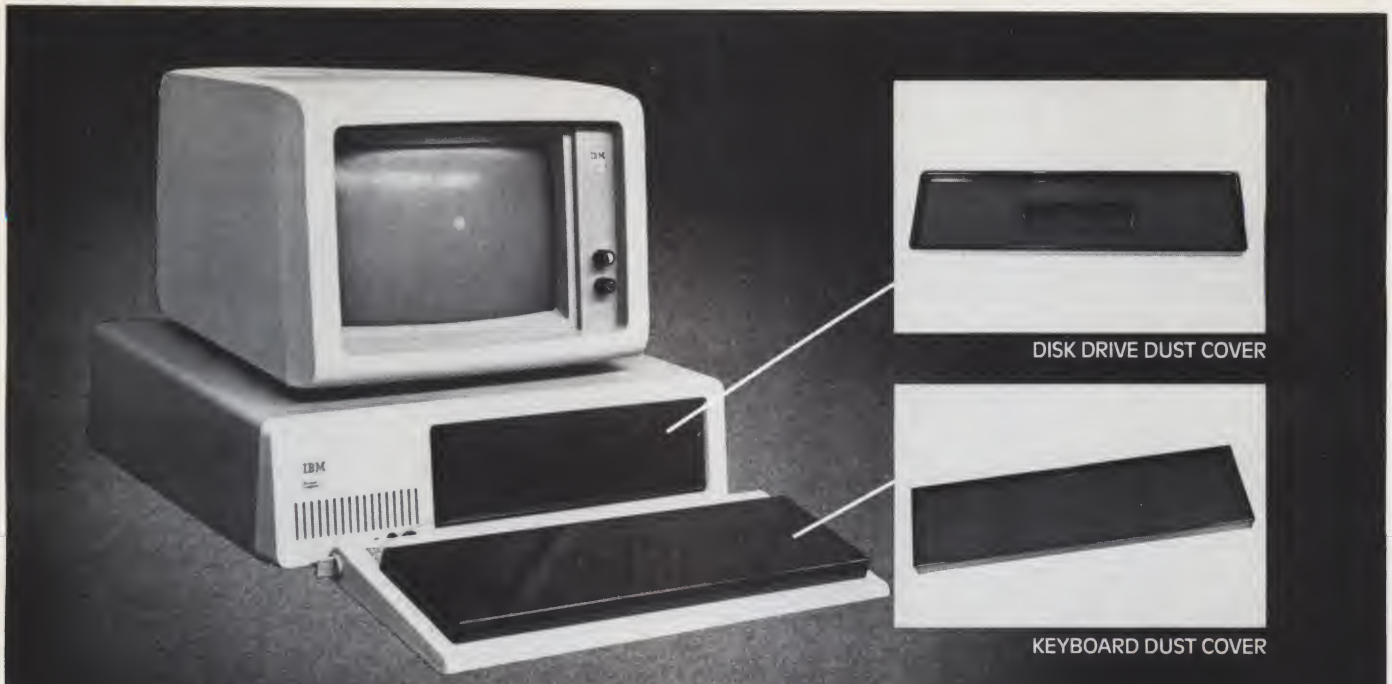
134 New Products

140 Calendar

146 Software Reviews
First Aid for Apple DOS
Word Games on the IBM
Curing WordStar's Weakness
Super Sinclair Disassembler

Cover Design by Jonathan Graves

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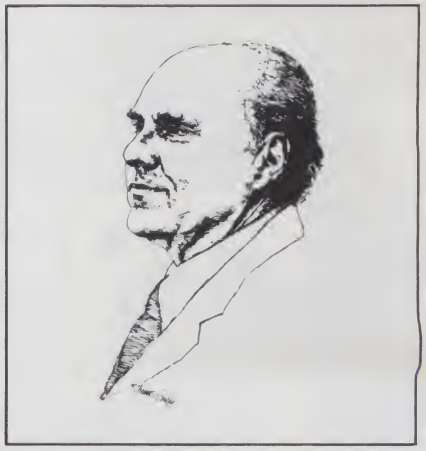
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PUBLISHER'S REMARKS

By Wayne Green

So, Who Has Time To Read 'Em All?

Eighth Anniversary Blues



It was May 21, 1975, when I signed on an editor to get the first microcomputer magazine going. If someone had called from the future and told me that eight years hence my beloved *Byte* would have cloned out around a hundred offspring, I'd have found it almost as hard to believe as I do right now. Ten more magazines were announced at the recent West Coast Computer Faire. This is crazy.

Well, I'm beginning to get into the spirit of it and figure that the five I'm publishing right now are just a start. I'm gearing up for at least a dozen new magazines next year. Why be chintzy about it? Let's roll up our sleeves and give 'em *two* hundred magazines to pick from. Why stop at only a hundred?

Let's see, we can get started on material for a new one aimed at the IBM PC. Why not? The ten magazines already going for that system hardly scratch the surface. Oh, we can give it a kick—perhaps we'll make it a PC-I/O magazine. I've always been partial to I/O—ever since I used that for a special microcomputer section of *73 Magazine* back in 1976.

Hey, how about a magazine for people who have both the VIC-20 and the Timex 2000? We might call that the 20/2000. It's imagination that puts you ahead in this field.

And if you think you have it tough trying to keep up with all of the computer magazines, how would you like to be a manufacturer faced with a hundred different magazines putting on the thumb screws to get you to advertise? With all that competition you can bet that some of the ad sales people are very, very aggressive. They visit, they call, they send letters, they send imaginative media packs, promising—hell, guaranteeing—anything you might be crazy enough to believe.

One of the reasons that so many magazines are managing to eke out an existence is that there are a lot of naive ad managers out there. They will bite at "bargains." They'll actually believe circulation figures that aren't audited and spend their money on 'em. They'll throw their money around like drunken sailors and then be surprised when their firms go down the toilet. I've watched some of the biggest and most arrogant of 'em flush away, sneaking what they could out of their plant in the middle of the night before the lock went on the door for good.

I just got a promotion for a new magazine, and I laughed when I read it. They have a "whopping guaranteed circulation" promised. They say they plan to get this by sending their magazine to all of the computer stores and by making a direct mailing to 100,000 computer owners. Well la-di-da. If that will suck in the advertisers, I've got one beaut of a bridge I can help them buy. It's in Brooklyn—old, but in good shape—and absolutely ripe for a toll booth that could earn millions.

The trend today is toward system-specific magazines. When we peeled *80 Micro* out of this magazine back in 1980, we had the first magazine devoted to a specific system. Now look at the field! But as a reader you also need to keep track of the whole industry, which is where *Microcomputing* is working for you today. And

that's in addition to *80 Micro*, *inCider*, *HOT CoCo* and some more in the pipeline.

There was a time when a specialty magazine in this field was one covering software. No more. Now Apple owners want to read about Apple software and not get frustrated by seeing articles on some of the tons of great stuff out there for the Olivetti. Say, you want to hear the modern day American religious war in action? Visit a computer club and listen to an Apple fanatic arguing with a Commodore fan. CompuServe is probably making millions letting VIC-20 nuts argue via their system with Color Computer zealots. Buncha screwballs who've lost all perspective. It's like religion and politics, with loads of heat and little light.

If you can keep yourself from buying too many different types of computers, you'll be able to keep your magazine subscription budget in check. But every time you suck in on a new computer you should remember that you're also adding another $25 or so to your magazine budget, plus the time it takes to read it. And if you *do* start getting more than one type of computer, how are you going to face yourself? You could become a basket case schizo trying to defend your JR-200 purchase to the other side of your personality, which bought the Timex 2000.

The Will to Travel

Every fall there is an organized tour of Asia which coincides with consumer electronics shows in Japan, Korea, Taiwan and Hong Kong. I've been on the tour three times, and I guess the only serious question raised in my mind is why there are only a couple of hundred, instead of a thousand, people on these tours.

The tour is one of the best ways of getting to see this fascinating part of the world. And if you have any interest in making money, the opportunities are there in abundance. These electronics shows are about the only way for smaller Asian firms—and there are an incredible number of them—to reach potential smaller American businesses. For every Sony and Hitachi, there are dozens of small firms that do not have the support of the giant trading combines, but which have interesting and often innovative products.

How do you go about getting to Asia? The first and major step is to make the decision to go. That's the most difficult part. Once you've decided, everything falls into place. The tourist agency, Commerce Tours (870 Market St., Room 742, San Francisco, CA 94102), books the best hotels, all of the transportation, your visas, tickets to the shows, and so on. There is a lot of organization that goes into these tours.

The tour agency organizes the sumptuous breakfasts, the many luncheons and dinners, often hosted by local Chambers of Commerce or business groups. Some of these meals, such as a Mongolian Barbecue in Taipei, are part of the tour.

The whole works, which takes about two weeks, costs around $2500. I do a good bit of traveling, so I know that Bob Chang, the wily Chinese chap who organizes these tours, must have squeezed the hotels, the bus lines, the airlines and every other service along the line to keep costs down that much.

You've missed the May spring tour of microcomputer shows, but you've still time to make the big decision to sign up for the consumer show tour in October. It's a good opportunity to see the major Asian cities. But, if you're interested in looking for something unusual to import and sell—perhaps by mail order—or a small firm to do circuit board manufacturing for you, or some item to use as a premium, you'll find it as you wander the halls of these four huge electronics shows.

> If you decide to go on the Asian tour, I guarantee that you'll never forget one minute of your trip.

The shows alternate between Tokyo and Osaka. You'll quickly get used to getting around on their subways, enjoy the food and marvel at the widespread acceptance of American fast food—McDonald's, Shakey's, Kentucky Fried Chicken, Wendy's, and so on.

After the formal part of the tour, you can either pack it up and rush home to sort out the disasters of two weeks away, or, as I do, start looking for some other places to visit in Asia as an extension of the trip. The cost of adding some most unusual places is not as high as you might think—often just a few extra hundred dollars.

Sherry and I added extra time in Tokyo and Guam to our 1979 visit. In 1980 we went on up into China for a few unforgettable days, and then made a side trip to the Portuguese Colony of Macao, just about an hour from Hong Kong by high-speed hydrofoil ferry. And last year we went on to Singapore, Bangkok, Manila and three incredible countries in northern Borneo: Sarawak, Brunei and Sabah. Those last ones are definitely well off the tourist track, and we wouldn't have missed them for anything.

You, too, can get into the travel mode—if you make the decision to do it.

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It's easier to just put it off, of course. You can find an infinite number of rationalizations for not doing things that are different. But if you do decide to go, I guarantee that you will never forget one minute of your trip.

On visiting countries after the tour, I have a particular advantage in that as a ham operator I already have friends in virtually every country of the world. Heck, hams even get to reefs accessible only at low tide to operate if they think they might qualify as a "new" country. And I'm hard put these days to find a country where we don't have subscribers to at least two or three of my magazines. Would you believe we have subscribers to *80 Micro* in Brunei? And *Microcomputing* is on the newsstands in Singapore and Bangkok.

My trip this spring will keep me from making the fall tour, but then I'm so darned busy on these trips seeing shows, having meetings with businessmen and so on that I hardly get to talk with most of the people on the tour. Not many of them get up at 6 a.m. and jog around the cities the way I do. And I often skip those giant breakfasts—if I didn't, I'd be waddling home at the end of the tour. Those business meetings with local manufacturers often go right on until midnight for me, leaving little time to socialize. If you're into doing business in Asia, you too may have 'em lined up to talk with you.

At the dinners, where it is normal to have the food placed on a lazy Susan in the center of each table of ten people, you'll have to have a fast set of chopsticks to keep ahead of me. And watch out for Bob Chang. He'll have you chugalugging that seemingly innocuous rice wine. Or he may lead an evening expedition into the heart of Taipei, where street vendors are eviscerating large snakes and hawking snake blood and ground bile. Weird—and enjoyed by the throngs of Chinese.

If you're interested in getting out of your darned shell and seeing Asia, drop a line to Commerce Tours or to me, and I'll forward your name to them.

You Don't Have the $2500?

Now I don't want to be mean about this, but you are right in the middle of one of the biggest bonanzas in history. People are making more money from microcomputers than they pulled out of the ground in gold in California a hundred years ago. Sutter's Mill was peanuts compared to the jackpot in Silicon Valley.

Every time some venturous soul plunks down $85 for a VIC-20 or $39 for a Timex-1000, you have a golden opportunity to make money. Between Timex, Commodore, Tandy, Texas Instruments, Atari, Apple and IBM, there are millions of small computers being sold. Every single one of those millions of people buying these computers are going to be looking for accessories to use with them—programs, information, service.

Unless you're dead asleep, the wide variety of opportunities to sell to this incredible market should have your juices going. Remember that the bigger the sales of a system, the more chances there are to sell add-ons. And with system-specific magazines springing up around every computer, you have it easy finding the customers. You're just shooting fish in a barrel.

This is why we've seen so many new millionaires in the last couple of years—and thousands of thousandaires. This is why some bookstores are selling over 3000 different books on computers and why we have nearly a hundred magazines. We have more than enough magazines now, so put your mind to programming and coming up with small accessories. How about a nice dedicated monitor for the Timex? Or a printer switch, so it can feed from several computers?

The microcomputer industry is going to keep growing for several more years as computers get into every aspect of education, business, science and the home. A piece of the action is there waiting for you . . . if you have the initiative to give it a try. And if you do get hooked on getting rich, the $2500 for a trip to Asia will be almost nothing.□

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By Robert W. Baker

A Day In the Life . . .

Commodore International On the Move

Commodore Tour

Back in early April I was invited, along with Dennis Brisson, managing editor of *Microcomputing*, to a tour of Commodore's facilities in eastern Pennsylvania. We were met by Neil Harris, who's in charge of the two Commodore magazines, and Diane Ottinger, from Commodore's public relations department.

It was a pleasure to meet the faces that belong to the various voices I've come to know over the phone during these past several years.

On the day of the tour, we spent most of the morning walking through the office area in Wayne, PA, which Commodore was in the process of moving from. In fact, there was a meeting in progress in which moving plans were being discussed. With Commodore's explosive expansion rate, the company's working quarters became cramped, so the move to a new and much larger facility isn't surprising.

We got to meet quite a few interesting people during the morning. Walter Kutz, the SuperPET product manager, talked about the continuing support for the SuperPET and how it's heavily used by schools. He spends a lot of time traveling across the country talking about the SuperPET, so you may get to meet him sometime.

By the way, rumors about the demise of the SuperPET are untrue. It's still being produced and gaining more and more support daily.

We also met Jeff Hand, who works with Commodore's offerings on CompuServe. We talked a little about future enhancements and what Jeff's group is doing. One project was an on-line conference, but it seems it was a little too much for CompuServe to handle.

Commodore also plans to offer programs for sale, via CompuServe, to complement the free public-domain programs you currently can download from the system.

Impressions

I've been using the CompuServe system for several months—whenever I can get on—and I'm learning new things about the system all the time. My biggest problem is with the local CompuServe input. It seems that the local input in Cherry Hill, NJ, can handle only two users at a time. Considering the number of users in this area, it's no wonder the input is almost always busy.

We also met Myrddin Jones, vice-president of marketing, Mike Tomczyk, vice-president of the new software group, and David Rosenwald, director of education marketing.

Rosenwald talked at length about the projected 80 percent penetration for computers in the school market by 1986 and Commodore's plans to support this market. Currently, only about 10 percent of schools nationwide have computers. Of these, about 50 percent use Apples, 20 percent have TRS-80s or CBM systems, and the rest are using Atari, Texas Instruments and IBM machines, among others. Apparently, the lower grades are the fastest-growing area of computer interest, but they have the lowest penetration.

During our talk, Rosenwald pointed out that cost appears to be the major factor in selecting a system for schools, and Commodore's offerings are well-situated regarding price-to-performance ratio.

The lower grades are using the VIC-20, where the larger character size is actually a benefit. Intermediate grades are using the Commodore-64 and senior grades are using the CBM-8032 or SuperPET.

Also, a new network for the Commodore-64 is ready to be announced. The network is being designed especially for schools, but it may be of interest to a number of other areas as well. Supposedly, you'll be able to intermix PETs and Commodore-64s within the network.

Rosenwald admitted that Commodore's teacher-training needs to be improved, but his company is working on this. Various seminars are being offered, and educational resource centers are being set up across the country.

The resource centers serve as primary grassroots support systems for educators, where teachers help other teachers. The information exchanged through these centers is proving to be invaluable for educators working with computers, many for the first time—and on limited budgets.

Any school or intermediate unit may, with the approval of its school board, apply to Commodore to become an educational resource center.

According to Rosenwald, the biggest inhibitor to schools is software. In the area of education, the computer can be used in two areas—as the object of instruction in teaching about computers, or as a tool in teaching about other subjects.

As an object of instruction, the SuperPET is ideal, with its variety of languages included with the basic system. The other Commodore systems are also of value in lower grades, teaching computer awareness.

There is a great need for more software for Commodore systems, as well as for most other computer systems. Commodore recently offered a collection of more than 650 public-domain educational programs on 50 disks that schools can get for the cost of duplication.

Rumor has it that the Minnesota Educational Computing Consortium is currently working with Commodore to produce a variety of new educational programs that should be available soon. Commodore also has Logo and Pilot ready to be released for the Commodore-64. The version of Logo is super and offers more features than the version offered by Apple, written by the same company. The quick demo I saw was really impressive.

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Peeking at Prototypes

We also got a chance to see some of the new prototypes, including the color printer and the color monitor. Unfortunately, the new portable models were sent back to Japan and we didn't get a chance to see them. Anyway, the color monitor is nice-looking and produces a beautiful display with the Commodore-64. It's apparently made by JVC, from what I've been told. I'll try to provide more details later, as soon as I can twist someone's arm and get one to play with.

After lunch we met Joseph Heimann, manager of special projects at MOS Technology. He gave us a little presentation on how ICs are designed and manufactured and then gave us a tour through the plant. The actual silicon chips are made here in Pennsylvania, shipped to Asia for assembly and then shipped back to MOS Technology for final testing.

Later in the day we got a chance to walk through Commodore's new West Chester, PA, facilities. It was an impressive site—the building is enormous. It should give Commodore plenty of room to spread out and grow.

Unfortunately, by the time we got there it was late in the day, and the production lines were shut down. Even so, I did manage to get a full collection of new C-64 software, which I'll be reviewing in later columns.

As I said earlier, Commodore employees were in the midst of moving when we were there, but they should be settled in by now. If you need to contact Commodore, the new address is: 1200 Wilson Drive, West Chester, PA 19380, and the telephone number is 215-431-9100.

News from Commodore

The newest video game from Commodore is making dentists, parents and kids happy. Tooth Invaders was developed for the Commodore-64 in cooperation with the American Dental Association. It was introduced during National Dental Month and is being enthusiastically supported by dentists, according to Bill Wade, Commodore's software director.

Fighting Cavities

Tooth Invaders combines the fun of a video arcade game with the most important principles of dental care. The game incorporates recommendations of the American Dental Association and is being used by dentists as well as parents. Already, more than 2000 dentists have ordered C-64 computers and Tooth Invaders cartridges for use in their offices.

Even without the educational tie-in, Tooth Invaders has all the elements of the most popular computer games—fast action, graphics, sound effects, nine levels of difficulty, "good guys" and "bad guys" *and an interesting* story line.

The game's motto is: "A Clean Tooth Will Not Decay!" To prove the point, characters like "D.K. Germ" and "Plaqueman" help teach the use of dental floss, proper brushing and the dangers posed by cavities and plaque buildup.

Tooth Invaders is an excellent example of how computer games can be used constructively to accomplish worthwhile goals.

Seminar Series

Commodore sponsored a 16-city seminar series between March and early May designed to help educators and administrators make better use of microcomputers in schools. The one-day seminars focused on a variety of topics, including Computer Literacy, Basic Skills, Applications, Gifted Education, Vocational Education, Funding, Telecommunications, Administrative Applications and Local Networking.

Educational computing specialists hosted the seminars, which focused on "real-world" problems and practical aspects of educational computing. The seminars provided an opportunity for educators to share their experience and swap software developed at their individual schools.

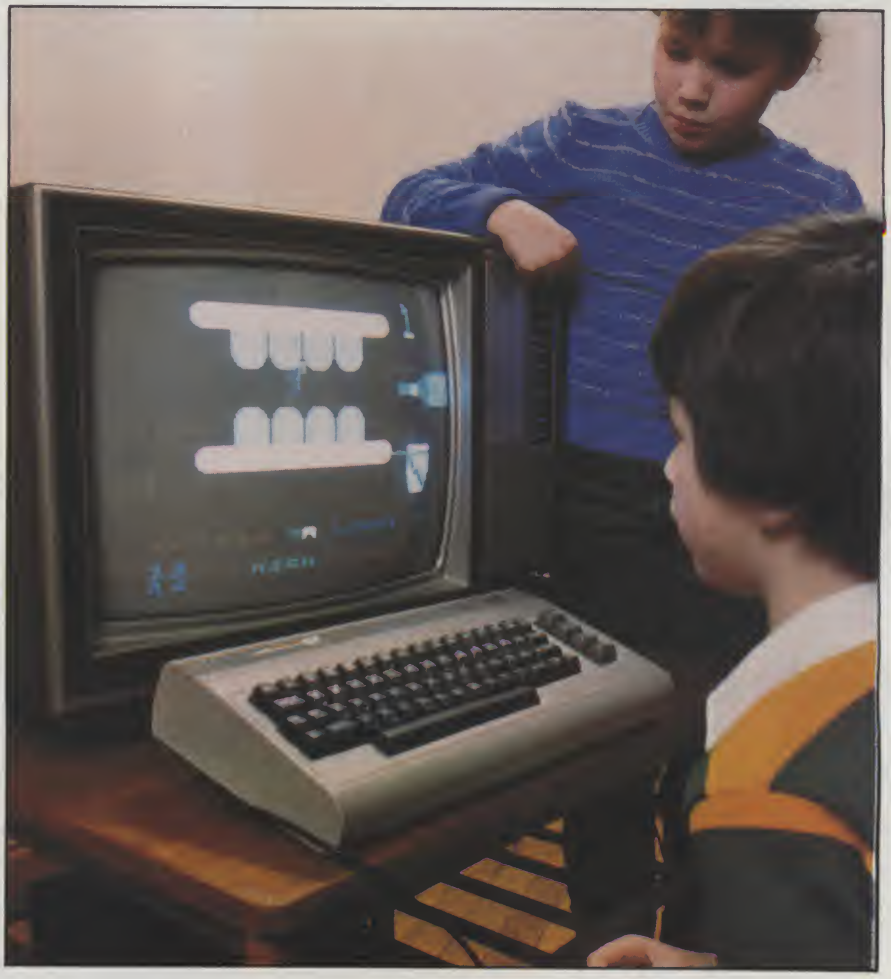
"There is a huge body of public-domain software available for Commodore computers, and we're now in the process of demonstrating this software and making it available to educators who wish to use it," David Rosenwald, director of education marketing for Commodore, said.

"Often," Rosenwald continued, "excellent software in a particular area, such as mathematics or physics, will be developed by a teacher and used for several years, but not distributed to other schools, which need and want that type of software desperately.

"In addition to providing training and advice for teachers who use computers in their classrooms," Rosenwald said, "we're actively encouraging the exchange of ideas and software so developments at individual schools can be distributed more widely."

Rosenwald indicated that seminar participants were to have an opportunity on a sign-up basis to copy more than 650 public-domain software programs that Commodore has made available to educators. Attendees also received a copy of the PET Emulator program, which allows programs written for the PET/CBM computers to run on the new Commodore-64 computer.

"Most schools in the United States have been using the PET and CBM since the mid-1970s," Rosenwald explained.



Tooth Invaders, a game designed for the Commodore-64, provides youngsters not only with experience in computing, but with tips on cavity-fighting.

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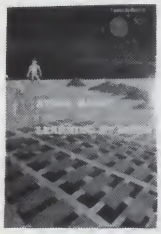
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"Now, many schools are acquiring the Commodore-64, and the PET Emulator allows teachers to convert their own learning software developed for the PET and CBM to the Commodore-64.

Commodore International's New Prez

Commodore International, Ltd., recently named Sigmund Hartmann president. Hartmann has more than 25 years of management experience in the computer hardware, software and data processing fields, coming from TRW in Los Angeles, where he held a variety of senior positions over an 18-year period. He has lectured on computer technology at various colleges and universities. He previously worked at Commodore in the early 1970's as general manager of U.S. operations.

Hartmann's immediate responsibilities involve establishing a broader nucleus of small-business, educational, home and recreational software for Commodore microcomputers, including several new models planned for introduction later this year. This represents a major commitment by Commodore to the development and marketing of software.



Commodore unveils another winner—the B-128/80.

Broadened Philosophy

In the past, Commodore's emphasis was in computer hardware. Today, its philosophy has broadened. Commodore designs and manufactures computer systems, and that includes software as well as hardware and peripherals. It intends to be a major factor *in the software* business.

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ware sales over the next 18 to 24 months.

One of the things Commodore has learned in the past year is that major retail chains and computer stores prefer "one-stop" shopping for software. Mass merchandisers, especially, want Commodore designers to provide a complete hardware/software package. That's what they're doing now, and they intend to do even better in the future.

In the small-business market, the software *is* the computer. The manufacturer has to provide top-quality word processing, electronic spreadsheet, accounting, database and management software. The new "B" series small-business microcomputers will be introduced this summer with some of the most powerful, best-selling software packages in the industry.

Commodore will continue to work closely with third-party software developers by inviting them to become partners. The company already has launched a major software-acquisition effort to contract existing software and to develop new programs. Commodore also is exploring new techniques for marketing software.

Pin Number	Name	Description
1	gnd	Protective ground
2	T×D	Transmit data
3	R×D	Receive data
4	RTS	Request to send
5	CTS	Clear to send
6	DSR	Data set ready
7	gnd	Signal ground
8	DCD	Data carrier detect
20		
6 & 8		
20	DTR	Data terminal ready

Warning: Commodore points out that Pin 13 *always* has +5 volts on it; do not connect anything to this pin and do not let stray wires touch it!

Table 1. Pin numbers, names and functions for RS-232 jumpers.

Commodore Specs

Preliminary specification sheets on two of the new systems from Commodore show that the first C-64-compatible portable computer is tentatively called the Executive-64 (it's also being referred to as the SX-100). It includes a built-in, six-inch color monitor with a 40-column by 25-line display and 16 colors.

Other features include standard SID sound capabilities (with three voices and nine octaves), a single built-in floppy disk with 170K capacity, External Video Port, Commodore Serial Bus and C-64-compatible External Bus (cartridge).

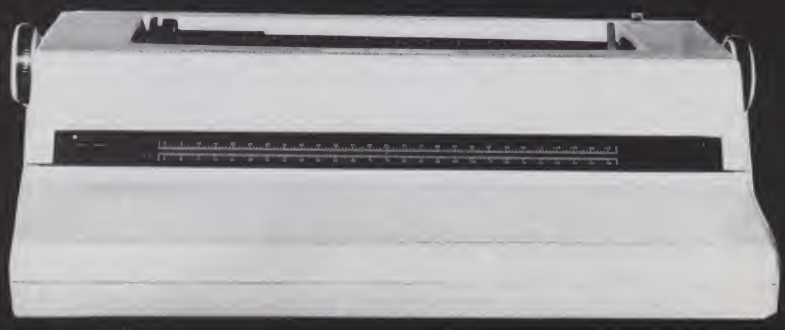
The second specification sheet shows details of the Commodore B-128/80. This system uses the eight-bit 6509 processor with a 2 MHz clock rate. It offers an

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$EFF1	Reset chip	Read status register
$EFF2	Command register	Command register
$EFF3	Control register	Control register

Table 2. Addresses and accesses for ACIA.

Control Bits	Function	Data (hex)
7	number of stop bits	0–1 stop bit 1–2 stop bits
6–5	word length	0–8 bits 1–7 bits 2–6 bits 3–5 bits
3–0	baud rate select 1 of 15 available; example: 0E = 9600	06–300 bps 08–1200

Table 3. Control bits and functions for SuperPET serial port.

Command Bits	Function	Data (binary)
7–5	Parity options	xx0–no parity 001–odd parity Tx + Rx 011–even parity Tx + Rx 101–mark parity on Tx Rx disabled 111–space parity on Tx Rx disabled
4	Echo/No Echo	0–no echo (Full Duplex) 1–echo Rx (Half Duplex)
3–2	Transmit control	00–Tx disabled, no RTS 01–Tx enabled, RTS 10–Tx disabled, RTS 11–Tx disabled, RTS transmit BRK
1	Receiver interrupt	0–interrupt enabled 1–interrupt disabled
0	Data terminal ready	0–disable Rx/Tx 1–enable Rx/Tx

Table 4. Command bits and functions for SuperPET serial port.

80-column by 25-line black and white display with business graphics, using an external monitor.

There's a full upper- and lowercase keyboard with a 19-key numeric keypad and ten dedicated function keys. The internal 128K RAM memory can be externally expanded. External interfaces include parallel I/O port, RS-232C, IEEE-488, video interface and cartridge. I assume it supports all standard PET/CBM peripherals.

Bonus Packs

Owners of the Commodore-64 should be interested in the new bonus packs offered by Commodore.

The Disk Bonus Pack is being offered free to anyone who buys a C-64 along with a VIC-1541 disk, or you can purchase it separately. A separate Tape Bonus Pack is also available for those without the disk. The package includes a number of utilities, graphics and sound demos, games, educational and personal programs. The tape version includes five tapes with programs that do not require the disk drive.

The utilities include:

- C-64.Menu—For easier loading of programs from disk.
- Change Disk—To change the disk device number via software.
- Copy-All64—For copying files from disk to disk.
- 1541 Disk Backup—For creating copies of entire disks with a single drive.
- Dump—Displays disk files in hexadecimal.
- Load Address—Displays the load address of any program file.
- Supermon64.V1—Is an expanded 6502 machine-language monitor.
- PET Emulator—For running existing PET programs on the C-64.
- DOS Wedge—For short-cut disk commands without using Print#.

Graphics and sound demonstrations include:

- Color Test—For adjusting your television monitor.
- Character Editor—For creating alternate character sets.
- HiRes Loaded—For high-resolution, two-color pictures.
- Sprite Editor—Creates sprites for future use with other programs.
- Organ—For a full keyboard solo or polyphonic organ.
- Songs—For sample music tunes.
- Sound Effects—Presents a wide range of sound effects.

Game programs included are:

- Arrow—A snake-type game where you try not to hit yourself.
- Joystick Demo.
- Labyrinth—A challenging maze game.
- Lemonade—Where you run a lemonade stand.

The educational and personal programs include:

- Bits & Bytes—Where you learn some fundamental computer terminology and concepts.
- Disk Commands—Teaches you to use the disk drive.
- Snoopy Math—A math game for youngsters.
- Amortization Table—Creates load-amortization tables for any type of loan.
- Calendar—Can display any particular month in any year.
- Mortgage—Calculates information essential to any mortgage.

SuperPET Serial Port

Some serial interface devices require only two connections, for the transmitted and received data, plus the corresponding grounds.

In RS-232 terms, the SuperPET is considered a Data Terminal and requires five control lines in addition to the data and ground lines. If the device connected to the SuperPET serial port, the Data Set device, cannot supply all the required control signals, then the plug at the SuperPET end needs several jumpers to function properly.

Specifically, one jumper is needed be-

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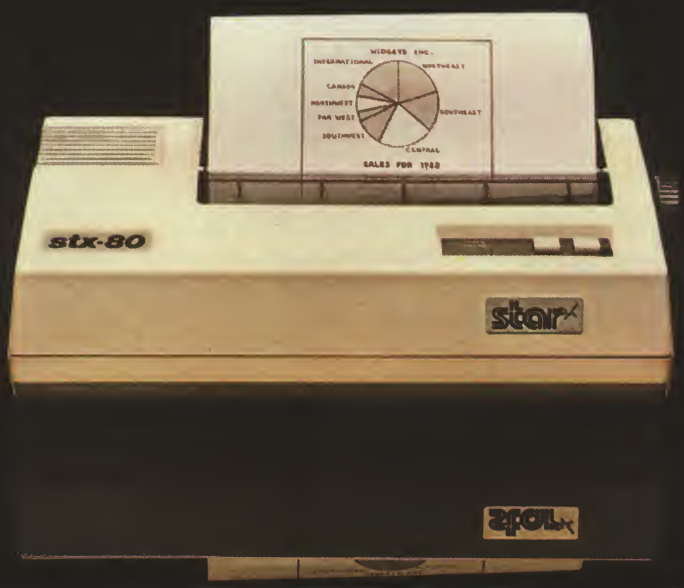
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Status Bit	Function (1 = condition true, 0 = false)
0	Parity error
1	Framing error
2	Overrun error
3	Receiver data register full
4	Transmitter data register empty
5	No data carrier
6	Data set not ready
7	Interrupt

Table 5. Status bits and functions for interrogating ACIA status.

tween pins 4 and 5, and another set of jumpers is needed between pins 6, 8 and 20 (see Table 1). These jumpers will fool the SuperPET into thinking that the serial line is connected properly and the two devices should be able to communicate.

However, there will be no handshaking to prevent data overrun, since the control lines are not really being used.

The SuperPET's serial port is controlled by a 6551 Asynchronous Communication Interface Adapter (ACIA) that features a software-controlled baud rate generator. The ACIA is "seen" by both microprocessors at the same address from $EFF0–$EFF3 or 61424–61427 decimal (see Table 2).

The control register is used to select the operating mode, word length, number of stop bits and baud rate, among other things (see Table 3).

The command register is used to control parity generation/checking, receiver echo and transmit/receive functions (see Table 4).

The status register is a read-only register and allows you to interrogate the ACIA status (see Table 5).

The RS-232 connector for the serial port is buried inside the SuperPET cabinet. It's a standard 25-pin female subminiature-D-type connector.

To get to the connector, you have to remove the two screws at the bottom of the cabinet and lift the top, but please be sure the power cord is disconnected first.

The Program Sampler

I'm currently assembling a collection of sample programs—to be called The Software Sampler—from various companies.

I intend to include programs that are offered as samples or demonstrations of available products and their abilities. The programs supplied will be grouped by system type, with separate disks for the PET/CBM, Commodore-64, VIC-20 and future Commodore systems.

The Software Sampler disks will be distributed via mail at a nominal cost to cover reproduction and handling fees.

Programs will be under 16K in length to allow a reasonable number of programs on each sampler disk. If more than one program is submitted by a single company, the programs will be put on separate sampler disks, whenever possible, to provide more variety on each disk.

Software manufacturers will have an opportunity to list programs offered as samples or demonstrations of available PET/CBM, Commodore-64, VIC-20 and future Commodore systems.

An information package will be generated and included on each disk to indicate what is included on that particular disk and whom to contact for catalogs or more information.

The Software Sampler should provide more information on what software is available, the companies selling the software and the quality of their programs. It'll give you a chance to see a variety of programs from a number of companies, at a minimum cost.

So far, more than 175 letters have been mailed to various companies across the country, and the initial response has been overwhelming. It probably will be several months before the companies have their sample programs ready, so watch for more details on when the first disks will be ready for distribution and what will be available.

If your company would like to participate and did not receive details in the mail, please write directly to me as soon as possible.□

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WHAT'S NEW, BIG BLUE?

By Thomas V. Bonoma

This PC Keyboard Feels Right at Home

Sneak Preview Of Best WP Under $50

Getting Personal

Well, here I am, pounding away on a KeyTronic KB5150 keyboard (courtesy of Pauline Elrod at KeyTronic, PO Box 14687, Spokane, WA 99214). I never could understand what the furor about the PC keyboard was all about. Sure, it's strange, but it has a fine feel to it, and you get used to stretching your fingers to infinity after a while.

The KB5150 ($235), contrarily, asks you to get used to nothing. Its designers moved the Shift and Return (that's right, no more symbols—just words) back to "where they belong," and that move alone earns a cigar.

Then, they cut that large "plus" key on the keypad in half, and made the bottom half an "enter" key. Great!

Then, in a stroke of absolute genius, they gave us LEDs on Caps Lock and Num Lock. (How many times have I wished for those?)

This keyboard has a totally different feel from PC's old standby. It's lighter, the keys in the middle are flatter (the KeyTronic people would call them ergonomic) and I do believe that when I quit hitting the slash key when I mean to hit the shift key and reeducate my fingers to no torture, it's going to be a whole lot faster.

Don't tell anybody, but I even dropped it—from about three feet. When I picked it up and shook it, not a rattle—and it works fine!

I understand you can get this nice addition for about $199 discounted, and it's worth it. (Wait until they try to get it back!)

This month, we're going to evaluate some new word processing and Calc-type programs. Then we'll look at three programs that really mean business for the business user. We'll also check out two new DBMS programs—one of them *not* called perfect but close to it and the other *called* perfect but not.

In the "other" category are two new languages, a symbolic mathematics system and one of the best copy programs I've seen. We'll conclude with "my" new graphics program, Created.bas, which was generated totally by the PC on the PC.

Texts and Calcs

Two new Calc-type programs are available, and you should be aware of them. From Perfect Software (702 Harrison St., Berkeley, CA 94710) comes Perfect Calc ($295), which runs in either monochrome or in color on the 64K PC.

Perfect Calc

Perfect Calc is part of the "Perfect" series of software (including Perfect Writer, Perfect Filer and Perfect Speller) that uses the same keystrokes in an attempt at integration. (As I write this, the Writer and Speller programs have not been released; Perfect Filer is reviewed below.)

Perfect Calc has several unique features. One: it's fast. Two: it continually swaps portions not only of its own code but of the data spreadsheet in and out of memory, so you don't need to worry about memory management—even on a 64K machine. The system deals with it for you.

Three: you can have up to seven spreadsheets active at one time (although you're limited to two display windows), you can overwrite one buffer with another (for example, add "expenses" from a subsidiary to a master spreadsheet) and even link spreadsheets together in true fashion so that recalculation on one affects all the others. Also, you can define the order and type (e.g., mutual) of dependency, and in this way deal more adequately with complex calculation requirements.

All these features make Perfect Calc one of the most flexible spreadsheets around.

Unfortunately, Perfect Calc has its drawbacks, and I think they're serious. The program obviously has been written to be exportable to a lot of different computers, because it's not customized to the PC at all. Instead, it relies on control- and escape-code sequences, often multiple ones, to invoke its functions.

For instance, you exit the program with <CTRL-X><CTRL-C>, a complex and unmemorable venture at best. "Home," "End," "Pg Up" and the like are not recognized either; instead, the corresponding codes needed for paging upward are <CTRL-Z>.

Even though some attention has been given to organizing these codes, <CTRL> always refers to vertical movement and ESC to horizontal; even with good on-line help, I find this command mumbo-jumbo less than satisfying. Since Perfect Calc uses no menus—instead taking the "blank screen" approach of VisiCalc—these codes are especially problematical.

Next, PC has a limited set of built-in functions (only 20 by my count), and most of them are statistical (ABS, AVG, COUNT) and mathematical (EXP, SQRT, LOG). The lone financial function, NPV, is a good one, but the program needs some expansion here.

Finally, and most seriously, you are unable to "point" to ranges in order to enter them into formulas. That is, instead of being able to write SUM(, and then point to the beginning and ending cells you're interested in, you actually have to write the cell letters and numbers into the formula.

In other regards, like number-formatting, recalculation speed and options, Perfect Calc is competent. I do wish, though, that its authors had taken the trouble to customize it to the PC. That would mean, however, that they couldn't write just one hardbound document to serve for all of its versions, as they have done.

By the way, the Lessons disk of tutorials, coupled with the ones in the manual, make this one of the better programs to learn if you'll put up with all the control/escape codes necessary. And, a reference card is provided (and needed).

EasyCalc

From Norell Data Systems (3400 Wilshire Blvd., PO Box 70127, Los Angeles, CA 90010) comes EasyCalc ($99.95), available for mono or color and also for a minimum of 64K (more is recommended).

You would swear that Perfect Calc and EasyCalc, when run in color, are from the

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same basic Calc routine. Two reasons are that the screen colors are identical and the prompts are identically placed. If these were papers submitted by two students, I'd call them into my office.

There are, however, important differences between the programs. EasyCalc offers neither virtual memory nor dependency spreadsheets, but it does customize itself to the PC's cursor-movement keys. And for the remainder of the commands, it uses a VisiCalc-familiar "command character plus command" sequence.

EasyCalc also has on-line help, contains a tutorial on the disk and has sample files. It has no reference card, though, and it doesn't allow cursor-pointing for formal input.

EasyText

Norell's EasyText ($79.95) is a text *post*-processor in the order of Runoff.

With EasyText, you need to prepare your text before using a text editor, and to insert in it at appropriate points various "dot" formatting commands, like ".ce" for center.

When you run your unformatted text through EasyText, it displays it either on the screen or on the line printer. Post-processors, like Runoff, largely have been abandoned since it has been possible to do interactive text processing with on-screen reformatting, a la WordStar.

However, there's much to be said for post-processors—they're quick, they use a relatively limited array of commands that produce powerful effects and they're tolerant of almost any strangeness in input format, as long as the output requirements are specified.

Norell's post-processor is supplied as a ".COM" file, and thus gives the kind of speed expected from Norell products.

SuperWriter

More in the realm of current approaches is Sorcim's SuperWriter ($295 from Sorcim Corp., 2310 Lundy Ave., San Jose, CA 95131), which I reviewed last month.

I told you I really liked the archiving, disk management and word processing routines themselves, which have all of the good and none of the bad of the old Magic Wand program.

I also told you that the program had a nasty habit of slowing down as the screen fills. I have since received an updated version of the program and had a chat with the marketing people at Sorcim.

Unfortunately, the updated version of the program doesn't fix this problem. Fortunately, the Sorcim people are aware of it; they've even named it ("screen burst") and are working at removing it. By the time you read this, the program should be bug-free, and, in that state, will be one of the more impressive word processors on the market.

If you have one of the versions with "screen burst," get on the phone and tell Sorcim that it's just not acceptable.

Finance, Graphics and Combination Programs

The big software news is Lotus Access Systems' 1-2-3 (see the May 1983 *Microcomputing*, p. 60, for a complete review). While that combination package is attracting all the attention, a few other graphics, business planning and combination software packages are worth looking into.

Micrograph

Micrograph (2Y's Associates Ltd., Box 6733, Station J, Ottawa, Ontario, Canada, K2A 3Z4; $245), is a graphing package that offers multiple inputs and outputs, along with some statistical/pictorial manipulations in the middle.

Micrograph accepts as input VisiCalc and SuperCalc files, and it has its own input editor. It will output its bar, pie or line graphs on an Epson, an HP7470A plotter or a Calcomp plotter (the plot routines require 128K RAM in your PC and an extra $50 out of your pocket).

Program interface modules for dBase II and for TK Solver are available at extra cost, and soon 2Y's will release an optional videotext database storage module as well.

The programs themselves, supplied in compiled Basic on a single disk, seem to run well; I had no trouble with the package. The trend-line analysis program, which reports statistics and trend statistics in a line graph format, is especially useful for statistical analyses.

There is no disk-based tutorial and there's only one sample file. At $295 for the base system, plus $50 for each plotter

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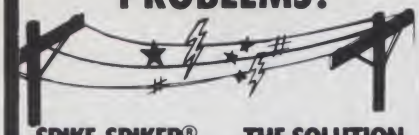
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module and $70 for the dBase and other interface modules, though, there should be lots more. The documentation, while adequate, is thin, and could be better.

Micrograph is a competent system, but it's overpriced for what it delivers. For the same $245 (but minus the statistical manipulations possible), Fast Graphs will do all that Micrograph will, and it will print or plot on anything you've got.

Bottom Line Strategist

From Ashton-Tate (10150 W. Jefferson Blvd., Culver City, CA 90230) is the Bottom Line Strategist (BLS), a decision-support utility for managers to help them determine financial and marketing strategies.

BLS ($400) requires PC-DOS or CP/M-86, 128K of PC RAM and a color or monochrome monitor (but you must specify which when you buy the package). BLS is useful for developing business plans, evaluating investment opportunities, pricing products, determining break-even points and analyzing competition.

The system consists of a master menu, submenus and output routines (which include paper reports and graphics on the PC screen). An executive overview of the system is provided; so is a flowchart of its operation among the menu choices.

First you'll input your key business assumptions, including ones about growth (development time for new products), rate of customer acquisition and time (in months) to reach 50 percent of maximum sales. The next assumptions set includes cash outlays and asks about fixed costs, variable unit costs and other costs, as well as about pricing policies.

The third area concerns productivity; it asks about the projected inflation rate and the "experience curve." The final assumptional input area concerns some accounting variables, like book value, salvage value and accounting method in use.

Once these things are done, the results per unit input are enormous. First, the program gives you your net present value and break-evens in a four-part summary that includes a cash flow analysis. Next, you can wander around the other options, most of which have graphics, bar or line charting displays.

Your customer growth curve by month, for example, is available from option 1 as a bar graph. Press P and it's dumped on your printer. While using the screen, zoom in or out on interesting portions of the graphs as you wish.

Ashton-Tate has a reputation for producing only the best business software to be had. BLS is no disappointment in that regard. Could you emulate all this in 1-2-3, or VisiCalc? Sure you could, because, except for the zooming and such, it's all marketing/financial modeling. But if you need to write a business plan for that new software venture you have in mind, this is one of the best packages I've seen.

Execute has integrated well its word processing, spreadsheet and DBMS programs.

Execu/Bus

Executec Corp. (3868 Carsen St. S321, Torrance, CA 90503) let me get an early look at its Execu/Bus system.

Execu/Bus, a software integrator and its associated application programs, requires a 128K PC to run. Execu/Bus itself allows data-sharing among all applications supported by the system. Included on the demonstration disks were Execu/Model, Execu/File and Execu/Writer. Missing was Execu/Graph, a graphics processor.

The system, which supports mainframe communications as well as importing/exporting files to the Execu/Bus, works well. There is on-line help available, and a full utilities package (e.g., a directory), like that of the "file and disk manager" routines in 1-2-3.

The individual software packages, such as Execu/Writer, are well-integrated with the PC's function keys and environment. Moving, at least from the spreadsheet to the word processor, is not difficult; it requires an "@include" statement to incorporate the saved spreadsheet file into the memorandum being prepared.

The word processor itself seems to be the best part of the system; it's smooth and has a number of time-saving commands, like "@itemize," which can be inserted into the text to perform functions when run through the post-processor and printing routine (PowerText is a more advanced version of this concept, judging from the Execu/Bus demonstration).

Of course, it's hard to tell much from demonstration programs, where the software must be used rather than more revealingly abused. From what I've seen, though, Executec has integrated well its word processing, spreadsheet, and DBMS programs. Whether the graphics package will also work as advertised when it is released, we'll have to see.

DBMS Programs

DataEase

From Software Solutions (57-C Wedgewood Road, Stratford, CT 06490) comes DataEase, a relational DBMS written in C which runs either in color or monochrome on the PC.

DataEase, which is supplied on four single-sided floppies, requires 128K of memory, two drives and PC-DOS. It is a forms-driven system, so even the configuration tasks for different machines and printers are done on easy-to-fill-in forms.

Configuring a printer, such as the

Prism, is as easy as filling in the blanks with relevant control codes. Those forms are presupplied for Epson, NEC and Diablo printers; the one for the Prism, promised in the manual, was not.

In addition, the system supports both multiple users and multiple security levels, and maintains its control with passwords. Up to 26 different databases can be managed in this manner, each with 20 forms, 255 fields per form, 255 characters per field and 64,000 records per form. The program is not copy-protected, and it can be moved over to a hard disk for large applications.

In use, DataEase is clean, functional and fast. It's "smart" enough, for instance, to keep the most recently used disk sectors in memory to reduce the need to call in from disk. It uses B-tree indexes, automatically kept, for important fields. Full and complete menus are given for each function, and the system is fully integrated with the PC's function keys to minimize keystrokes.

Your records (forms) can be multiple pages long, can include many field types, including a "multiple choice" one, and are easy to design and reorganize when that becomes necessary.

Perhaps the most outstanding feature of this system, though, is its report generator, which uses a "Query Report Language" (a cross between plain old English and DBMS-ese to simplify the task of pulling data from the system). In addition, full facilities for backing up, restoring and database status are supplied as utilities.

DataEase is a serious, integrated system that has been well-thought-through and well-coded for managers and hobbyists alike.

Where are the problems? Well, in a system like this one, a critic is reduced to nit-picking, so here goes: I wanted default entry, range-checking and automatic filling options on the data entry system, but I didn't find them (only VersaForm has these features, but it has drawbacks too; see my March 1983 column).

When a manual *says* it has a predefined form for the Prism printer, it ought to have one. Also, the manual (although complete) has no on-disk tutorial or example files to help with what I found to be tough sledding. A quick-learning handbook, however, is supplied in addition to the reference manual.

If you buy DataEase, Software Solutions says it'll soon be releasing a fully-integrated word processing package and a graphics package for the DBMS.

Perfect Filer

Well, nothing's perfect. Or is it? Here comes Perfect Filer (Perfect Software, 702 Harrison St., Berkeley, CA 94710; $595), which has its documentation in a

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paperback book form, according to a press release, because the authors believe in making the program perfect the first time, and not in revising.

When they start making claims like that, I start looking very, very closely.

Looking closely didn't help, however, because neither of the two copies of Perfect Filer that were sent to me would work correctly. I called Perfect Software, and on the third telephone call, I reached someone who assured me that the version of the program sent to me was the same as the one sent to dealers, and that I'd "be taken care of." I wasn't.

What follows is from the manual, 'cause I sure didn't see Perfect Filer work.

Perfect Filer is a menu-driven, color or monochrome DBMS that, like its cousin Perfect Calc, is well-written and quite extensive. The program comes with two different tutorial databases on disk (an organizational and individual one), has online help and nicely done tutorials in the documentation.

The filer program itself is complete and concise, containing some versatile sort routines, selective subset search and report criteria, and built-in date/time, financial and relational formats.

Data-edit forms and printer forms both can be defined on Perfect Filer, allowing you to manage data viewing and retrieval and to use the same data on the printer for mailing labels, invoices and straight columnar reports.

Perfect Filer basically uses the same cumbersome command set as Perfect Calc (although the letters sometimes stand for different things). So, in theory, if you wade through the memorization necessary to use one of these programs, you can use all four.

Like Perfect Calc, Perfect Filer is uncustomized to the IBM, and it relies on all those control and escape sequences instead. I'll let you know more after I've been able to get a working version of PF, and after I've seen Perfect Writer.

Other Stuff

Microsoft (10700 Northup Way, Bellevue, WA 98004) has released its muMATH/muSIMP-80 for the IBM PC.

In case you weren't aware of these programs and language (there's a whole high-level language here, besides a full applications set), muSIMP is Microsoft's attempt to simplify and rationalize LISP (LISt Processing language) for the microcomputer. LISP is best known in applications involving artificial intelligence.

The muSIMP-80 provided by Microsoft has a full-function set, a resident editor and, generally, pretty much everything you'll need in order to learn a variant of LISP.

But you don't *want* to learn LISP? That's OK, because the muMATH portion of Microsoft's product has one of the best (and only) nonmainframe symbolic mathematics systems available. It will reduce fractions, do algebra and even differentiate and integrate functions for you. As the manual says, it's designed to take the "busy work" out of relational mathematical manipulations so that you can concentrate on learning and exploring.

muMATH is a nice package, although it's not easy for the novice user to work through, because too much time is spent in the documentation on the functions and options of the package and not enough on teaching the user. A good set of disk-based tutorials, which run in mu/SIMP, of course, are supplied with muMATH. More could have been done, however, with the education aspects of this product.

If you ever need to know how to make sense of 3*X↑3 + 13/X↑1/91 + 21*X = Y + 2X * 3, muMATH can tell you.

Thread

Thread ($249 from DWB & Associates), is an interpretive threaded language that claims more understandability than its relatives, like Forth.

A threaded language usually is built from a small set of procedures, or words; other words can be defined from these,

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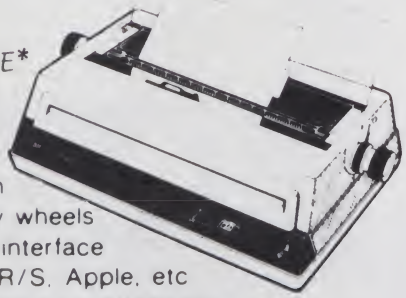
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giving the language both extensibility and compactness. Threaded languages usually, but not always, employ a stack to perform their operations.

Threaded languages are meant to produce more efficient code than higher-level languages can produce; Thread is meant to allow interpretive use (like Basic), which generates code nearly as efficiently as compiled code. The authors have gone to some lengths to adapt their creation to the PC, providing a complete cursor-control routine and even a sample game for the user.

Copy][PC ($39.95, Central Point Software, PO Box 19730, Portland, OR 97219) is a PC copy-utility for making copies of disks, including uncopyable ones. The program requires one disk drive, 64K of memory and any display mode.

Copy][PC is functionally equivalent to Diskcopy and Diskcomp combined, and it does its job well and quickly. It has several nice additions, too; it automatically takes advantage of any extra memory you may have, giving you, for example, a disk drive speed-check routine. Additionally, there are no troublesome parameters to set or check, and operation is automatic.

I tested the program on several "uncopyable" disks with names you'd know, and it performed flawlessly each time, causing no trouble to the source disk and producing useable copy. I do not condone and will not countenance pirates, but I do think that buying a $1000 software package entitles you to as many back-ups as you think you need.

WordVision

Bruce & James, Inc., has introduced the Pioneer's Edition of WordVision for the PC ($49.95 from Bruce & James, 680 Beach St., Suite 357, San Francisco, CA 94109).

WordVision starts life with two claims to fame. First, it's dirt cheap. Second, it's written by Jim Edlin, of *PC* magazine fame. The Pioneer's Edition is a prerelease version of WordVision, and, at this time, is incomplete (no on-line help and no centering or right justification), a little glitchy (it can mess up block moves) and not yet in final form.

However, it's a harbinger of what the final package will look like, and I state unqualifiedly that it is the best value you'll ever get for $50, and maybe for three times that amount.

WordVision is *smooth*, and cursor movement is as fast as anything I've seen. The feel is great, and operation is definitely designed for folks like me, who want absolute transparency between themselves and the machine.

The program runs nicely in color and equally well in monochrome, giving you on-screen underlining, boldfacing and other features associated with products like WordPerfect (but without the $500 price tag). Like WordPerfect, WordVision has a phrase store/recall capability; you don't have to keep typing "WordVision"—two keys can do it for you.

The program has an outstanding disk store/recall routine, one of the best print formatting set-up routines I've seen and, generally, is well-conceptualized. When the final version hits the streets, you won't believe what you can get for $50. But don't wait, because if you buy the Pioneer's Edition and find some buggies, B&J will refund your purchase price.

There are some things left out of this package, and I don't mean left unfinished. For example, no headers and footers are supported, the macro capability only stores five phrases at a time, and no overtyping is permitted (which is called a feature by B&J, and a problem by me). There is no spelling checker, but I'm sure one is in the works, and only the IBM/Epson printer is supported. That's nit-picking, though; I really can't say enough about this word processor.

Finally, from Banbury Books (37 West Ave., Wayne, PA 19087) comes a book and disk combination for the PC, *The IBM PC Guide* ($29.95). Author James E. Kelley, Jr., takes the reader from power-

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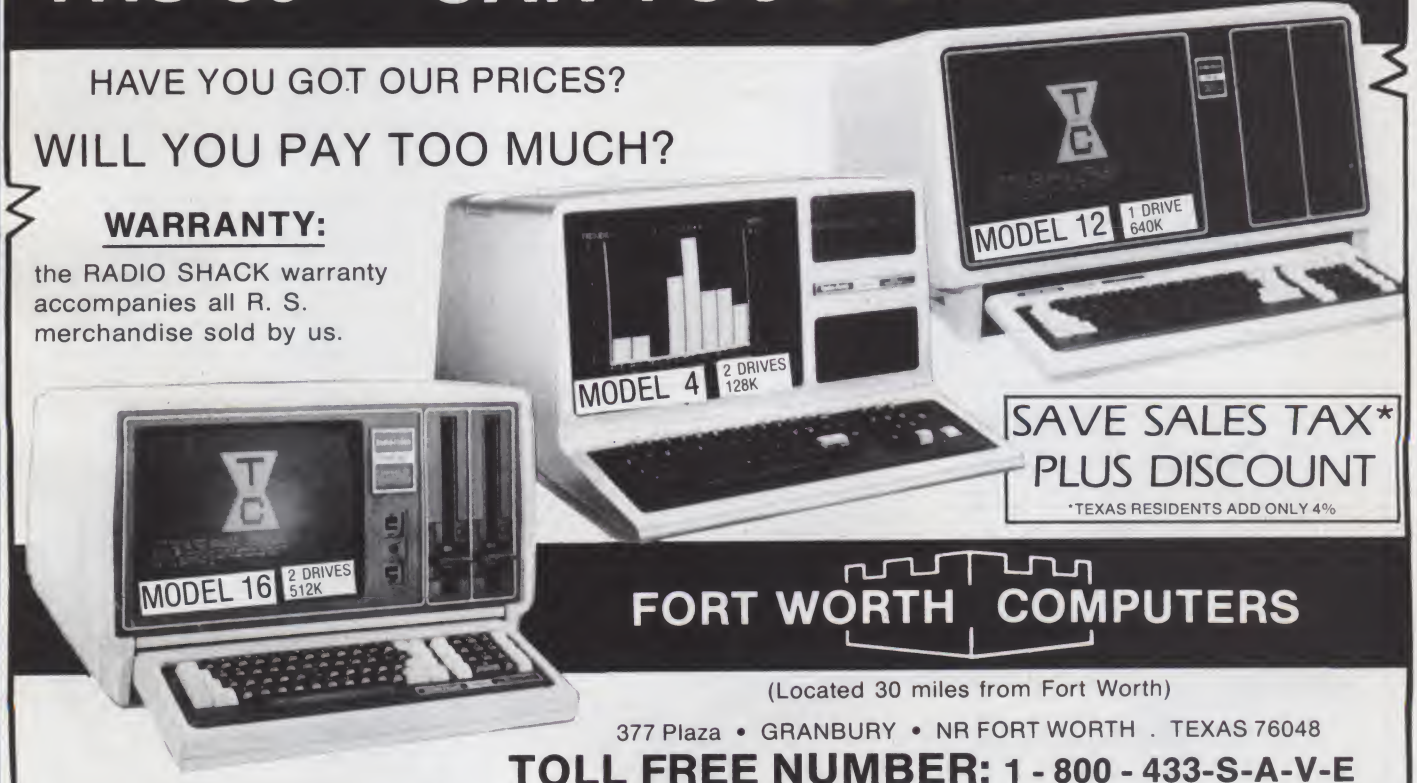
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  3.. Create A Menu Module               4.. Create An Input Module
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  7.. Create A Delete Module             8.. Create A Sort Module
  9.. Create A Search Module            10.. Create An Aging Module
 11.. Create A Word Processing Module   12.. Create An Ending Module
 13.. Create A Graphing Module          14.. Create A Sound Module
 15.. Create A Date Module              16.. Create An Output Module

                        :    Program  Generator    :

 17.. Create An Entire Program          18.. End The Program

                 Make A Selection, Then Press The ENTER Key:__
```

Fig. 1. Main menu screen of The Creator.

on through DOS boot, menus and strings; he even has a chapter on errors the PC can give you. He then devotes chapters to disk operations and file manipulation, report generation, pictures and data files. In each chapter, he clearly marks topics considered advanced, so that the beginning user can skip them or the advanced user focus on them.

The disk contains 35 files (mostly utility programs) and pictures associated with chapters and tasks given in the book. This results in an integrated package.

If you're a learner, you might want to give *The IBM PC Guide* a try.

Created.bas

This month's program was never touched by human hands. . . . Well, almost never. It was generated as four subroutines by a Basic program generator called The Creator ($300, Software Technology for Computers, 430A Main St., Watertown, MA 02172), and is used by permission of those kind folks as an illustration of what this well-thought-through program can do for you.

I've reproduced the main menu screen of The Creator in Fig. 1, which accompanies the listing of Created.bas (what would you call it?). Let's walk through what had to be done in order to get the listing.

The first choice I made was to generate separate subroutines, and link them later. (It's also possible to design a program from beginning to end, without leaving The Creator, if you want.)

I entered Create a Title Module, and was allowed to choose what symbol I wanted for the screen border, what I wanted to say (up to five lines per title), where I wanted to say it (from screen lines 3 to 18) and whether I wanted it said in inverse, flashing or normal text.

Then the disks would grind and grind, and finally, 30 minutes later, there would be code, right?

Not at all. I had my title subroutine in three seconds flat!

The Creator wanted to know if I wanted that code output to the printer, and, after that, whether I wanted to save it to disk (you'll need 64K, mono or color screen and one or two disk drives to use the Creator).

So, having time on my hands, I created an instruction screen that tells you how to use "my" program (it isn't really mine—there are about two lines of original code in the listing). To do this, I pushed Instruction Module, and was faced with a serviceable line (not character) editor that allowed me to enter up to 20 lines of 78 characters each and to modify them before saving.

Code generation after entering? An awesome one second.

Still having time on my hands, I pushed Create a Graph Module. This option creates a stand-alone monochrome bar-charting program that allows you to enter up to 12 data values; it then bar-charts them as raw data, as quarterly data, as percentages and as a line chart.

This option also gives you statistics (minimum, maximum, sum and average) on your data right on the graph. Two or three little inputs later, and a total of six seconds, I had my second module. I saved it to disk.

At this point, I had three modules on the disk and no program. I had planned to make one, though, so I told The Creator to generate code for each module with different line numbers, suitable for merging in Basic. I loaded GRAPH.DTA, merged in TITLE.DTA and then INSTRUCT.DTA, and *voilà*: the program in Listing 1!

Well, not quite. I got to playing with the Created.bas program, and I thought it was awfully quiet. So I reran The Creator, called Create a Sound Module and was allowed to test my sound as to notes and durations until I found one I liked. The result is merged into the listing as subroutine 7000.

All that remained was to add the appropriate gosubs (The Creator supplied the returns) for the sound routine, and we were done.

Total time investment for this useful, finished program? Fourteen minutes. The total time for me to code that little devil without some help? Three to six hours.

I've not shared with you some of the other modules, which are far more useful than the ones I illustrate here.

The Input Routine Module, for example, makes the setting up of random access or sequential data files a snap; it also does a marvelous job of organizing your prompt screens, establishing data ranges for valid input, and even default values to be input if no entry is made. The Output Module routine is also nicely done, allowing mailing list or columnar report output to be sent to screen or printer.

The search, delete, view, sort and change modules are useful for manipulating and updating disk records. The aging module finds days between dates, and the invoice module generates a program to bill folks for your time. Even the word processing module, which produces a stand-alone line editor for your

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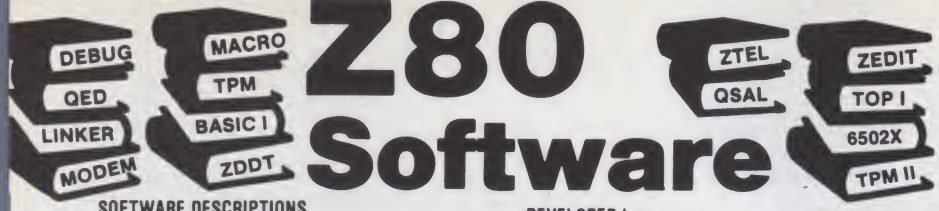
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use and/or incorporation into another program, is well-done within the limits of Basic and the constraint that you have to edit whole lines, à la Runoff.

The Create a Whole Program option automatically manages the interleaving of line numbers and merging of all the modules into one grand program, so that you don't have to do it. But it isn't hard, even when done by hand.

The most outstanding feature of the Creator, in my opinion, is its speed. It takes just seconds to generate most code and minutes to generate most programs.

There are things The Creator is not suited for, and you can deduce them from the menu. You wouldn't, for example, want to try to generate color graphics with this system . . . it can't be done. And, although the designers claim otherwise, I sure wouldn't want to write a text adventure on it. But for utility and business programming, within the limits of most users, it's just fantastic.

Oh, I should mention that you can do anything you'd like with the finished code—sell it, give it away or even publish it in a magazine!□

Listing 1. Created.bas graphics program.

```
    Time:  15:23:09                        Date:  03-03-1983

          "CREATED.BAS"...A machine-generated graphics program!

                              Generated by THE CREATOR

                          with a little help from T. Bonoma
```

```
10 'A Program to Generate Bar Graphs...Itself Machine-Generated!
20 'USED BY PERMISSION OF        SOFTWARE TECHNOLOGY FOR COMPUTERS
30 '                             430A Main Street, Watertown, MA 02172
40 '                             (617) 923-4334
50 'The following lines were **not** totally machine-generated:
60 '            - all lines preceding 100
70 '            - the subroutine call in line 250
80 '            - the "return" in line 4200
100 CLS:WIDTH 80:A1$="*": FOR T=1 TO 78: A1$=A1$+"*":NEXT:LOCATE 1,1:PRINT A1$
110 FOR I =2 TO 23:LOCATE I,1:PRINT "*";TAB(79);"*":NEXT
120 LOCATE 3, 31:COLOR 0,7: PRINT "A CREATOR SAMPLER": COLOR 15,0
130 LOCATE 5, 10:COLOR 0,7: PRINT "TITLE MODULE INSTRUCTIONAL MODULE AND GRAPHIN
G MODULE MERGED": COLOR 15,0
140 LOCATE 7, 12:COLOR 0,7: PRINT "USED BY PERMISSION OF SOFTWARE TECHNOLOGY FOR
 COMPUTERS": COLOR 15,0
150 LOCATE 9, 27:COLOR 0,7: PRINT "GENERATED BY T. V. BONOMA": COLOR 15,0
160 LOCATE 20,23:PRINT "... Press Any Key To Continue ..."
165 GOSUB 7000 'gosub SOUND...a module I created and linked in later.
170 LOCATE 23,1:PRINT A1$
180 PT$=INKEY$:IF PT$="" THEN  180
190 CLS
200 REM - END OF TITLE ROUTINE
250 GOSUB 4000 'I added this line my little ole' self...TVB
500 REM - Graphing Program -- Bar, Qtr, % and Scattergram
505 GOSUB 7000 'another call to subroutine sound...
510 CLS:KEY OFF:WIDTH 80
520 DIM A(12),B$(12),A$(12),D(12)
530 LOCATE 1,30:COLOR 0,7:PRINT " G r a p h  P r o g r a m ":COLOR 15,0
540 LOCATE 3,1:INPUT "Title For Graph (46 Char. max):",TL$:IF LEN(TL$)=0 THEN  5
40
550 IF LEN(TL$)>46 THEN  540
560 B3=INT(((62-LEN(TL$))/2))+8
570 LOCATE 5,1:INPUT "Vertical Axis Title (6 Char. Max):",VT$:IF LEN(VT$)<1 OR L
EN(VT$)>6 THEN  570
580 PP$=STRING$(4,219):TA$=STRING$(63,196):PB$=STRING$(4,223)
590 LOCATE 7,1:INPUT "Bottom Title (46 Char. max):",BE$:IF LEN(BE$)=0 THEN B4=1:
GOTO  620
600 IF LEN(BE$)>46 THEN  590
610 B4=INT(((62-LEN(BE$))/2))+8
620 CLS
630 DATA "Jan","Feb","Mar","Apr","May","Jun","Jul","Aug","Sep","Oct"
640 DATA "Nov","Dec"
650 FOR J=1 TO 12:READ B$(J):NEXT
660 TT=0:HN=0:TP=0:LN=0
670 LOCATE 1,28:COLOR 0,7:PRINT " D a t a    E n t r y ":COLOR 15,0:PRINT :FOR M
=1 TO 12
680 YY=CSRLIN:XX=POS(0)
690 LOCATE YY,XX:PRINT "Data For "B$(M);:INPUT "";A$(M):A(M)=VAL (A$(M)):IF LEN(
A$(M))=0 THEN  690
700 TT=TT+A(M):IF M=1 THEN LN=A(M):HN=A(M):GOTO  730
710 IF A(M)<=LN THEN LN=A(M)
720 IF A(M) >=HN THEN HN=A(M)
730 NEXT M
740 TP=TT/12:SC=INT(HN/10):FOR I=1 TO 10:R(I)=(11-I)*SC:NEXT
750 CLS
760 VT=HN:LT=LN:AV=TP
770 GOSUB  780:GOTO  790
780 LOCATE 25,B4:PRINT BE$:RETURN
790 FOR J=1 TO 12:LOCATE 23,10+(J-1)*5:PRINT B$(J):NEXT
800 GOSUB 810:GOTO  890
810 LOCATE 1,1:PRINT VT$;TAB(B3);TL$
820 LOCATE 1,69:PRINT CHR$(218)LEFT$(TA$,11):FOR F=2 TO 16:LOCATE F,69:PRINT CHR
$(179):NEXT :LOCATE 17,69:PRINT CHR$(192)
830 LOCATE 2,70:COLOR 1,0:PRINT "   Legend  ":COLOR 15,0
840 LOCATE 4,71:COLOR 1,0:PRINT "Max. Value":COLOR 15,0:LOCATE 5,71:PRINT USING
"######,.##";VT
850 LOCATE 7,71:COLOR 1,0:PRINT "Min. Value":COLOR 15,0:LOCATE 8,71:PRINT USING
"######,.##";LT
```

More →

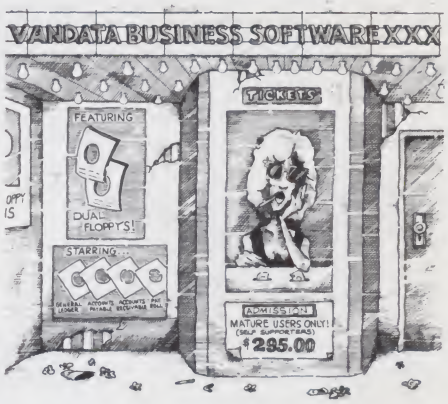
Listing continued.

```
860 LOCATE 10,73:COLOR 1,0:PRINT "Average":COLOR 15,0:LOCATE 11,71:PRINT USING "
######,.##";AV
870 LOCATE 13,73:COLOR 1,0:PRINT " Total ":COLOR 15,0:LOCATE 14,71:PRINT USING "
######,.##";TT
880 LOCATE 16,73:PRINT LEFT$(PP$,1);" graph":LOCATE 17,70:PRINT LEFT$(TA$,11):RE
TURN
890 GOSUB  900:GOTO  910
900 FOR J=2 TO 22:LOCATE J,8:PRINT CHR$(179);:NEXT :RETURN
910 GOSUB  920:GOTO  960
920 FOR J=2 TO 20 STEP 2:LOCATE J,1:PRINT USING "######";R(J/2):LOCATE J,7:PRINT
 CHR$(196);:NEXT
930 LOCATE 22,8:PRINT TA$
940 LOCATE 22,8:PRINT CHR$(192);:REM This draws the corner
950 RETURN
960 FOR M=1 TO 12:J=(A(M)/HN)*9:IF J=0 THEN  1000
970 FOR K=21 TO 21-INT(2*J) STEP -1
980 LOCATE K,10+(M-1)*5:PRINT PP$;:NEXT K
990 LOCATE 22,10+(M-1)*5:PRINT PB$;
1000 NEXT M
1010 S$=INKEY$:IF S$="" THEN  1010
1020 CLS
1030 Q(1)=A(1)+A(2)+A(3):Q(2)=A(4)+A(5)+A(6):Q(3)=A(7)+A(8)+A(9):Q(4)=A(10)+A(11
)+A(12)
1040 C$(1)="QTR-1":C$(2)="QTR-2":C$(3)="QTR-3":C$(4)="QTR-4"
1050 QT=Q(1):QL=Q(1):FOR T=1 TO 4:IF Q(T)<=QL THEN QL=Q(T)
1060 IF Q(T)>=QT THEN QT=Q(T)
1070 NEXT T:QV=(Q(1)+Q(2)+Q(3)+Q(4))/4:VT=QT:LT=QL:AV=QV:GOSUB  780
1080 FOR J= 1 TO 4:LOCATE 23,14+(J-1)*15:PRINT C$(J):NEXT
1090 REM - Do quarter graph
1100 GOSUB  810:GOSUB  900:PRINT
1110 SD=INT(QT/10):FOR T=1 TO 10:RQ(T)=(11-T)*SD:NEXT :FOR J=2 TO 20 STEP 2:LOCA
TE J,1:PRINT USING "######";RQ(J/2):LOCATE J,7:PRINT CHR$(196);:NEXT
1120 LOCATE 22,8:PRINT TA$:LOCATE 22,8:PRINT CHR$(192);:REM - corner
1130 FOR G=1 TO 4:J=(Q(G)/QT)*9:IF J=0 THEN  1170
1140 FOR K=21 TO 21-INT(2*J) STEP -1
1150 LOCATE K,10+(G-1)*15:PRINT PP$PP$PP$;:NEXT K
1160 LOCATE 22,10+(G-1)*15:PRINT PB$PB$PB$;
1170 NEXT G
1180 S$=INKEY$:IF S$= "" THEN  1180
1190 CLS:VT=HN:LT=LN:AV=TP
1200 GOSUB  780:FOR J=1 TO 12:LOCATE 23,10+(J-1)*5:PRINT B$(J):NEXT
1210 GOSUB  810:GOSUB  900:FS=INT((HN/TT)*100):FOR T=1 TO 10:D(T)=FS-(T-1)*(FS/1
0):NEXT T
1220 FOR J=2 TO 20 STEP 2:LOCATE J,1:PRINT USING " ###_%";D(J/2):LOCATE J,7:PRIN
T CHR$(196);:NEXT
1230 GOSUB  930:FOR M=1 TO 12:J=(((A(M)*100)/TT)/FS)*10:IF J=0 THEN  1270
1240 FOR K=21 TO 22-INT(2*J) STEP -1
1250 LOCATE K,10+(M-1)*5:PRINT PP$;:NEXT K
1260 LOCATE 22,10+(M-1)*5:PRINT PB$;
1270 NEXT M
1280 S$=INKEY$:IF S$= "" THEN  1280
1290 CLS
1300 VT=HN:LT=LN:AV=TP:GOSUB  780:FOR J=1 TO 12:LOCATE 23,10+(J-1)*5:PRINT B$(J)
:NEXT
1310 GOSUB  810:GOSUB  900:FOR J=2 TO 20 STEP 2:LOCATE J,1:PRINT USING "######";
R(J/2):LOCATE J,7:PRINT CHR$(196);:NEXT
1320 GOSUB  930:FOR M=1 TO 12:J=22-INT((A(M)/HN)*20)
1330 LOCATE J,11+(M-1)*5:PRINT CHR$(248)
1340 NEXT M
1350 S$=INKEY$:IF S$= "" THEN  1350
1360 CLS:LOCATE 1,33:PRINT "Ending Routine"
1370 LOCATE 3,10:PRINT "1.. Run Again With The Same Data"
1380 LOCATE 6,10:PRINT "2.. Enter New Data"
1390 LOCATE 9,10:PRINT "3.. End The Program"
1400 LOCATE 15,23:INPUT "Enter Your Selection Number (1-3):",W$:W=VAL(W$):IF W<1
 OR W>3 THEN  1400
1410 CLS
1420 IF W=1 THEN  750
1430 IF W=2 THEN CLS:CLEAR:GOTO 520
1440 END
1450 REM - End of Graph Program. Generated by THE CREATOR on 01-01-1980 at 00:01
:03.
4000 CLS
4010 PRINT "This program accepts data input for 12 values.  It then generates so
me"
4020 PRINT "rudimentary univariate statistics and presents the user with several
"
4030 PRINT "graphic representations of his/her data.  The program automatically"

4040 PRINT "generates a bar chart of the frequencies entered;  when you push the
 space"
4050 PRINT "bar it regenerates the data as quarterly (e.g. month 1 plus month 2
plus 3)"
4060 PRINT "data and redisplays it.  Press the space bar again and your data wil
l"
4070 PRINT "be redisplayed as percentages of the yearly total."
4080 PRINT "Press the space bar one final time and the data are transformed from
 a "
4090 PRINT "bar graph into a point graph.  Finally you'll be given the options t
o"
4100 PRINT "do it all again with the same data.  Or you can input new data.  Or
you"
4110 PRINT "can end the program."
4120 PRINT
4130 LOCATE 22,23:PRINT "... Press Any Key To Continue ..."
4140 PT$=INKEY$:IF PT$ ="" THEN  4140
4150 CLS
4160 REM - End Of The Instruction Routine.
4200 RETURN 'I also had the wisdom to put this little line in...TVB
7000 REM - This Is A Sound Subroutine. It Should Be Called From Your Main Progra
m As A Subroutine.
7010 FOR T =1 TO 3
7020 SOUND RND*1000+37,2:SOUND RND*1000+37,2:SOUND RND*1000+37,2:SOUND RND*1000+
37,2:SOUND RND*1000+37,2:NEXT T
7030 RETURN
7040 REM - End Of The Sound Subroutine, Go Back To Your Main Program.
```


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By Frank J. Derfler, Jr.

What's Next For Printers?

Move Aside, Ink Jets And Lasers

It's our job here in the Overview section to spot trends and to keep you advised on the course of the microcomputer industry so you can make the best hardware and software investments.

This month, we'll be hardware-oriented. We'll look at new developments in printers, another internal modem for the IBM PC and a unique communications device that gives even an acoustic modem an auto-answer and autodial capability.

Pursuing Pretty Printing

Dot matrix printers are fast, reliable and economical. But for most of us, they're also a compromise. The quality of typical dot matrix printing isn't really what we want, but we sacrifice print quality for cost.

We want what has come to be called "letter quality." That is, we want the finished page to look like it was typed on an office typewriter. Usually, the print produced by the IBM Selectric typewriter is the real (but unstated) standard of quality.

The letter-quality "look" comes from either a type ball, a thimble, or a daisy wheel striking the paper. But these kinds of devices are complex, and complex mechanical devices that operate fast either are prone to frequent failure or are expensive.

Bring Out the Daisy Wheels

The industry has responded to this situation in two ways: first, slow but inexpensive daisy wheel printers were brought out; second, the quality of dot matrix print was improved.

The first successful low-cost daisy wheel was the Smith-Corona TP-I. This American-made product has been popular with people who are sure they want the finest in print quality, but don't want to pay the price usually commanded by the daisy wheel and thimble machines.

The TP-I prints at about 12 characters per second. This is more than twice as fast as most of us can type, but it seems like a snail's pace compared to the other 45–55 cps letter-quality machines.

The TP-I also has been slow to be integrated with a form-feed mechanism. The need to stop and insert a new sheet of paper for each page makes the whole printing process comparatively slow.

As this article reaches print, Smith-Corona should be announcing a new TP-II printer. This machine is supposed to be quieter, faster, stronger and able to handle a good form-feed mechanism.

So if you really need the finest in letter-quality printing, but you don't want to pay the highest price, the TP-II should be a good investment. I'll tell you more after I have had my hands on one.

Over on the dot matrix side of the house, things have been moving fast. The Japanese are the pioneers in dot

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The Microline 93 is one of two printers recently released by Okidata. This high-speed printer produces 160 characters per second, but can also produce correspondence-quality printing at about 40 cps.

matrix technology; they were driven to that position by their own need for printers that can handle the ideographic and other character sets associated with non-European languages. They consistently have been making dot matrix printers that go faster and can produce well-formed and flexible character sets.

Microline 93

I have been using a new Okidata Microline 93 for several months, and I'm impressed with the machine.

The ML 93 is one of two new printers released by Okidata. The ML 92 has a carriage able to take only standard-size paper; the ML 93 can accept paper up to 16 inches wide. Otherwise, the printers are identical. Both are fast (160 cps), flexible and inexpensive.

The feature of the Microline family I enjoy most is the ability to produce impressive-looking "correspondence-quality" print at about 40 cps.

"Correspondence quality" is a phrase invented by a marketing person to describe print that is probably good enough to use in business documents and certainly good enough to use in letters to your friends, but not quite as good as "letter quality."

Correspondence-quality printing is created by using two passes of the printhead over the line and moving the paper slightly between passes. My analogy is that it looks as if it were typed on a portable typewriter using a cloth ribbon.

The Microline 93 and 92 printers both have solid cast-metal bases and weigh about 30 pounds. They use a nine-pin printhead that has large cooling fins to help it radiate the heat that this fast-moving part can build up. The ribbon winds and unwinds between two good old reliable (and inexpensive!) spools.

The 160 cps bidirectional printing capability of the Microline printers produces an output quickly. This speed of printing has changed my writing habits and increased my consumption of paper considerably.

I have proven to myself that I'll never proofread from a CRT as well as I do from a piece of paper. I don't quite understand why this is true, but according to some discussions on CompuServe's Authors' Special Interest Group, others seem to have the same problem. I can turn out a better article or chapter if I pull off a printed copy and rework it on paper.

The Okidata Microline has made this much easier to do. I can pull off a normal dot matrix copy of ten double-spaced pages of text in about two minutes. Then, after I have made my changes and corrections, I can enter one control code and get a correspondence-quality copy of the text that will please the poor editors and proofreaders who have to read the stuff I send in.

The Okidata ML 92 has a suggested retail price of $699. The ML 93 has a suggested retail price of $1249. Aside from the ability to go out to 136 columns of regular-size print, the ML 93 also has the ability to reproduce 64 block graphics shapes. You do, however, have to write the software to send the printer the codes necessary to use these graphics shapes.

Controlling the Printer

Speaking of codes, there is a standardization problem in the printer industry. No two manufacturers use the same control codes to designate the various kinds of printing. They do use a wide variety of commands for printhead positioning and graphics printing.

Since IBM adopted the Epson printer for use with the IBM PC, many software manufacturers have integrated the Epson coding scheme into their graphics packages. The Okidata printers have the ability to produce graphics, but their command set is not the same as the Epson's, and the resolution is not as fine.

If you try to create a graph on an Okidata printer using the graphics software with the Epson commands, you'll get some very strange output. If you want to use an Okidata with a software package designed for some other printer, you have two choices: you can either modify the software to produce the proper output codes, or install a translator in your operating system.

Modifying the software to produce the proper output can be simple. Some software packages have utility programs allowing you to patch the main program. Other programs allow direct entry of control and escape codes through the keyboard.

If you're using WordStar under CP/M, for example, you can patch the program with the installation utility to allow full underlining, various print fonts and expanded and emphasized print with the Okidata printers. You signal the printer through the use of the control-P codes in WordStar. (Table 1 provides the values to insert into the WordStar installation program, as well as some of the control-P codes to use.)

An approach to use with programs specifically designed for a different printer is to have the operating system catch the graphics commands and translate them into something the Okidata understands properly.

Application Techniques, Inc., markets an EP2OKI (Epson to Oki) translation program for the IBM PC. You can obtain different versions of this program—versions that integrate themselves into either PC DOS or CP/M 86 and catch and translate the commands for the different fonts and sizes of print as they go out the printer port. EP2OKI costs only $50 and it's simple to use. You can call the program from a batch command file when you boot a disk. (I don't know about you, but between the memory check for 412K of RAM and a list of about five programs in my batch file, I can turn on my IBM PC, go cut the lawn, take a shower and sit down at the machine just as the disk stops turning. Well, it *seems* that long!)

EP2OKI will not allow your Okidata printer to use all of the Epson graphics codes but it's useful for word processing and other programs that may contain only the Epson commands for underlining, overstrike and other special functions.

Applications Techniques expects to have other translation and screen-capture programs for the Okidata and IDS printers available soon. If you need this kind of software, you can contact Appli-

Label	Description	Value
PSOMTH	Printer Overstrike	FF
BLDSTR	Bold Face	03
DBLSTR	Doublestrike	02
PSCRLF	CR + LF	02,0D,0A
PBACKS	Backspace	00
PSHALF	Half LF	00
ROLUP	Superscript	02,1B,4A
ROLDOW	Subscript	02,1B,4C
RIBBON	Correspondence Mode	02,1B,31
RIBOFF	Data Processing Mode	02,1B,30
PALT	Alternate Pitch (10CPI)	01,1E
PSTD	Standard Pitch (10CPI)	01,1E
USER1	12.0 CPI	01,1C
USER2	17.0 CPI	01,1D
USER3	Double Width Print	01,1F
USER4	Continuous Underline	01,1B,1F

For continuous underlining, use control-P RC to begin the underline and control-P RD to end.

Table 1. Installation codes used to customize WordStar for the Okidata series of printers. See p. 3-9 in the Installation section of the WordStar manual for instructions on how to use the installation labels and addresses. This table is valid only for CP/M versions of WordStar.

cations Techniques, Inc., 80 Townsend St., Pepperell, MA. Phone them at 617-433-9934.

The Okidata ML 92 and ML 93 are fine machines and they represent the state-of-the-art in dot matrix printers in this price range. But one question that this column always tries to answer is, "Where are we going?"

Haven't we pushed dot matrix to look about as good as it can look? Can we ever improve on mechanical designs so they are less expensive and more reliable?

Soothsaying

In the case of printers, I have a favorite prediction: the Japanese and Americans have a technology that they understand well, but they haven't hooked it to a micro...yet. That technology is photocopying.

Many photocopying technologies are available, but almost all modern methods make good-looking copies on plain paper at high speeds, particularly if you measure their output in cps. Many of the photocopying methods are able to interface with electronic characters and graphics generators.

I predict that the next real progress in printers will come from devices descended from copying machines rather than typewriters. Sure, ink jet printers and laser printers will be on the market, but the winning technology will involve using photocopying techniques.

The output from these devices looks excellent, the text can be rotated, blown up or reduced, the costs are reasonable and the technology is off the shelf.

Do you want to make a million bucks? Buy the photocopying product from a major manufacturer, do the integration and market it with great fanfare. I only want one percent.

Ven-Tel PC Modem Plus

A few months ago I reviewed the Cactus Technology internal modem for the IBM PC. At that time, I predicted that Cactus Tech would have a lot of competition.

Now, Ven-Tel, an old and established firm in the commercial modem market, has released an integrated modem and software package that plugs into the IBM PC and gives complete auto-answer and autodial features with one of my favorite terminal emulation software packages: Crosstalk.

The Ven-Tel PC Modem Plus is contained on one full-length (13½-inch) IBM PC accessory card. The card includes both the modem and a separate serial port.

The modem itself is normally addressed as Comm 1 by PC communications software, although it can become Comm 2 by changing a jumper. The serial port on the card is always addressed as Comm 2, if it is turned on. If you have another serial port in the system, you can arrange the ports in various combinations, but you cannot have two ports at the same address at the same time.

Installing the Ven-Tel board includes the attaching of a jumper wire to the PC's speaker. This jumper allows you to listen to the telephone line so you can hear possible busy signals and the sound of the modem dialing. The addition of the jumper does not interfere with the normal uses of the speaker when the modem is not activated.

I wish, however, that Ven-Tel had put a volume control on the board for the speaker. Different telephone installations have different levels and different people have different tolerances for the sound of dial tones and modem squeals. A small volume control would be a nice-to-have feature on this modem.

Built for Expansion

The modem card itself is built for expansion. A separate plug strip on the board is designed to accept a piggyback 1200-baud expansion board using the Bell 212 signaling scheme.

The basic PC Plus is a 300-baud Bell 103 modem, but the $360 Speed Adapter

Circle 53 on Reader Service card.

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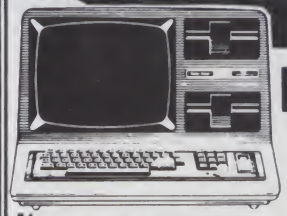
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turns it into a complete modem, capable of 1200- and 300-baud service. The Crosstalk software can handle speeds well in excess of 1200 baud.

PC Modem Plus sells for $389. The combined PC Modem Plus and PC Modem Speed Adapter package retails for $749.

Because it is a direct-connect modem, the PC Plus simply plugs into the telephone line through a standard RJ-11 wall jack. Two jacks are included on the modem board so you can connect the modem to the wall and then connect a standard phone to the modem for normal voice use.

The outstanding feature of the Ven-Tel PC Plus is that it responds to the same commands used by the Hayes Smartmodem. The success of the Hayes standalone modem has made its command set the most widely used in the industry. Certainly, more software is available to support the Hayes modem control codes than those of any other hardware.

Microstuf's Crosstalk program is packaged with the PC Plus, but any program that will interface with the Hayes Smartmodem will also work with the PC Plus.

Crosstalk Talk

Crosstalk, as readers of this column know by now, is a program that has extensive help functions, operates capably at high speeds and has flexible file-capture and file-transmission features for use with information utilities and electronic message systems. It also has a special protocol file transmission scheme for highly accurate file exchanges between Crosstalk-equipped systems.

If you want reliable and almost "invisible" performance, then the Ven-Tel PC Plus provides an answer.

Additionally, the Crosstalk transmission protocol is used by Transporter, an automated message-exchange system marketed by Microstuf. Transporter can use the Ven-Tel PC Plus modem to dial telephone numbers automatically at preselected times, establish contact with other Crosstalk or Transporter systems, exchange files and sign off.

Transporter also can receive calls and exchange files without operator attention. The Ven-Tel PC Plus package does not include Transporter, but the software can be used with the modem without modification.

The advantage of this kind of integrated modem over a stand-alone device is that it does not need extra cables and connectors, it does not take up extra room and it is less expensive. The only real disadvantage is that you cannot see the flashing lights indicating that data is coming and going.

If you want reliable and almost "invisible" performance, then the Ven-Tel PC Plus provides an answer. The complete package includes the modem board with the speaker jumper, a nice manual in an IBM PC-style binder and a copy of Crosstalk. The list price is $389.

For more information, write to Ven-Tel at 2342 Walsh Ave., Santa Clara, CA 95051, or call them at 408-727-5721.

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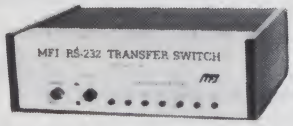
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with microcomputers for a number of years. Those of you with Commodore systems probably know that TNW was one of the first to help PET owners to communicate. Its new release, Operator, is an intelligent device that connects between your computer, your modem and the telephone line. It responds to ASCII commands from your computer or terminal and automatically dials outgoing calls or answers a ringing phone line.

Operator monitors the line and listens for the carrier tones coming from the distant end. If these tones fail or drop off, Operator hangs up the line.

Operator is easy to use, but its command set is unique. It does not respond to the same commands as the Hayes Smartmodems or other "smart" devices. This means that software designed with the Hayes command set will not work with Operator without modification.

Because of its internal programming and its function as a line monitor, Operator will function only with Bell 103 type modems. That means it can be used only at speeds up to 300 baud. It will not function at higher baud rates.

Operator can provide a unique alternative for you if you want autodial and autoanswer service without paying the price for a complete new modem.

If you have an acoustic modem such as the Novation Cat, you would install Operator by plugging it in series with the modem in the RS-232 line. Attach Operator to the telephone line and plug a standard telephone instrument into Operator's second PL-11 jack. Turn on the modem, put the telephone handset in the modem's cups and turn to the keyboard.

You can use any terminal program to type instructions out to Operator. It can dial using either tones or dial pulses. When Operator or the modem do not detect a modem carrier on the telephone line, Operator simply sits and waits for your command. You can tell it to dial simply by typing DIAL.

After Operator dials the call, it leaves the job of generating modem tones and exchanging information up to your local modem. If you want to get Operator's attention while it is on line, you send it an "@" sign.

TNW's Operator fills a unique slot in the data communications community. If you want automatic capability, but don't want your old modem to gather dust on a shelf, call for the Operator.

TNW Corp. is located at 3444 Hancock St., San Diego, CA 92110, (phone 619-296-2115).

* * *

Nifty Styling

I usually don't introduce you to products that I haven't personally seen or used, but VoiceStation, the Sydis integrated workstation, is such a good-looking device that I just had to mention it.

VoiceStation isn't a microcomputer, but rather a terminal for use with computer systems. It combines a telephone, a mouse for data entry and a full-function keyboard.

The styling of this unit is outstanding and I know I'd like to have one on my desk.□



VoiceStation, developed by Sydis, Inc., of San Jose, CA, is a uniquely packaged office workstation integrating voice, text and graphics. Note the use of a mouse and touch keys around the screen for manipulating data. For more information, contact Sydis, Inc., 4340 Stevens Creek Blvd., San Jose, CA 95129 408-243-8430.

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LETTERS TO THE EDITOR

QX-10 Article Convincing

Jim Hansen's article on the Epson QX-10 ("The Quintessential Computer," April *Microcomputing*, p. 66) confirmed my interest in the computer. However, it was the article on the Valdocs operating system ("Vive la Difference! Valdocs," May *Microcomputing*, p. 86) that finally convinced me to purchase the QX-10.

I must congratulate Mr. Hansen on the articles. They were well-written and addressed all the questions a potential purchaser would ask. They were convincing, not as a clever sales pitch, but as an honest appraisal without vested interest.

Silvio A. Bedini
Washington, DC

Two 1-2-3 Corrections

Thank you for publishing my review of 1-2-3 (May *Microcomputing*, p. 62). There are, however, a couple of small points that ought to be corrected.

First, the main subheading under the title claims that 1-2-3 is capable of word processing. It is *not*, at least in this version.

Second, there is an omission in Table 1 (p. 63), which compares 1-2-3 to the MBA. Specifically, under the word processing row, the MBA should be credited with its good but still first-generation word processing capabilities. That is to say, this entry for the MBA should read "Rudimentary. Heads, page numbers, and other features supported. Suitable for short documents."

Thomas V. Bonoma
Concord, MA

Is That a Quote?

I have been trying to enter Russell King's File Manager program ("A Small Wonder," March *Microcomputing*, p. 72) into my Timex-Sinclair 1000 computer.

There seems to be a hangup in line 8275 of the program. My computer will not enter unless I make the line read 8275 Let A$ = A$ + " ". In fact, trying to print the original (with *one* quotation mark) blew the program, but I had been saving by tape, so I didn't lose it all.

What should line 8275 be?

Donald Bauerle
Radnor, OH

Reply:

An ending quote is required in line 8275. It is easy to miss in the listing, because there are 20 blanks between the quotes. These blanks are there to ensure that old label fields will be entirely erased when new field descriptions are entered.

Russell King
Regina, Sask.

Yes, It Will

I would like to thank you and Thomas Bonoma for the review of VersaForm you published in the March 1983 issue (p. 10) of *Microcomputing*. I would like, however, to correct an error of fact in that review.

Table 1 (p. 12) stated that when doing a report, VersaForm would not select forms on the basis of column items. If it were true, this would indeed be a major restriction, but, in fact, VersaForm *will* select items on the basis of its column items, or indeed any item in a form.

This is one of VersaForm's major strengths, and it is the feature that enables a user to obtain a report, for instance, of sales by product from a file of invoices.

Joseph R. Landau
President
Applied Software Technology
Los Gatos, CA

Put It in Writing

I would like to comment on the sudden purchases of low-cost computers and the actual use of the devices. I think it would be interesting to observe how many of these are sitting on a shelf collecting dust because of the awful documentation. With rare exceptions, I have yet to see a home computer sold that can answer the question of, "Well, I completed the user's manual—now what?"

Surely we are passing from the days when only hobbyists work these things. Now the general consumer is interested, responding to the ads and the promises. However, there is a genuine frustration on his part as he attempts to reason, "Is this a 'O' or an 'O'? Do they mean, 'l' or 'I'?"

I am mentioning the above to demonstrate a case in point. The low-cost computer's hardware and software is excellent. The documentation is terrible.

Obviously, I come from a noncomputer background. Due to poor documentation, I am unable to use my Commodore disk drive to its full potential; I still do not understand how to put a VIC-20 into its advertised high-resolution graphics, despite the fact that I read articles constantly praising its capability in this regard. Even the articles are too technical, generally written for engineers.

I read the other day that the Apple IIe manuals were written, reviewed and revised months before the product was made available. If this is true, it is about time. We need more of such professionalism.

But unless someone can convince me otherwise, I believe the home-computer industry is leaving its supporters abandoned with lousy paper material.

My main point is that the general nonhobbyist consumer will not subscribe to ten computer magazines, cruise the bookstores and travel miles to user's group meetings to see the "Wonders of Recipe Files" when the Rotoflex is still quicker.

I would love to hear Bill Cosby do an album on home computers. Recall his car repair story about the A-frame needing replacement. His response was, "Riiight! What's an A-frame?!" The principle is the same in computers. Disk drive

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manuals throw one immediately into the terminology—"Riiight! What's a sector?"

Larry Rymal
Joaquin, TX

Computers in Real Estate: A Sleeping Giant

I believe that the use of computers in the real estate industry is a sleeping giant about to awaken.

I plan to publish listings of available real estate software. The listing will show what the program will do, the language it will operate on, the type of hardware it will run on, the price and the name and address of the source. There will be no charge for the listing.

I would appreciate receiving information from all sources outlining the information they would like to have included. I need everything and every program related to the real estate industry.

J. Don Shields
Drawer 758
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Everybody Has a Dream

Heroes, motivation, dreams! These are the things that make life worth living.

You start with a hero figure, someone to look up to, to respect and admire. Then you pick a dream. You combine thoughts of heroes with thoughts of dreams and you get motivation—a burning desire to accomplish, to create, to achieve.

However, these three jewels of life need a fourth for completion. They need guidance and perseverance. Guidance is the better of the two, because it would obviously make things easier. But with enough dreaming, perseverance can begin to take root and grow.

Wayne Green, you are the hero—one of the keys, one of the jewels. You, and all the other men and women who put dreams, hopes and ideas into the mind's of others, plant the seeds for future successes.

Even if I never succeed, Mr. Green, you've given me something to pass on to others: the love of accomplishment and the satisfaction gained from reading about the joy you obtain from your success—financially, intellectually and emotionally.

But for now you are my inspiration and motivation, so please don't ever listen to anyone who tells you he's turned off by words of business strategy or dreams of other accomplishments for yourself or others.

I'm waiting for your first book on how you started your magazines!

Bryan Greifinger
New Hyde Park, NY

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MOUNTAIN PILOT	0452TS		$19.95	
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The C-64 Sounds Off!

The C-64 contains a truly sophisticated sound effects synthesizer. The author gives you a comprehensive look at its music-making capabilities and introduces you to other sound effects it can generate.

By Richard F. Daley

When it comes to sound, no other computer on the market can hold a candle to the Commodore-64.

The C-64 replaces the simple tone generator that's found in many computers with a true three-voice sound synthesizer. This synthesizer is of musical instrument quality. Furthermore, the programmer has control over a large number of parameters: Waveform, Frequency, Volume, Attack/Decay and Sustain/Release. This allows the programmer to design each note's tone color and to shape the envelope.

Music-Making Machine

However, sound generation is of considerable complexity. You'll need to learn all about the Poke command, which involves a long list of memory locations, as well as the values you should Poke into those locations. It also means that any complex sounds or musical scores may well be quite slow.



To generate a sound on the C-64, you need to do several things:

1. *Initialize synthesizer*—You need to set such parameters as Volume, Waveform, Attack/Decay and Sustain/Release. These parameters can be constants, unless your sound effect needs to change them.
2. *Sound note*—The frequency of the note is set and the delay parameter, if any, is handled.
3. *Quit*—This will take care of the shutting down of the synthesizer. Usually, this can be accomplished by setting the Volume, Attack/Decay and Sustain/Release to zero.

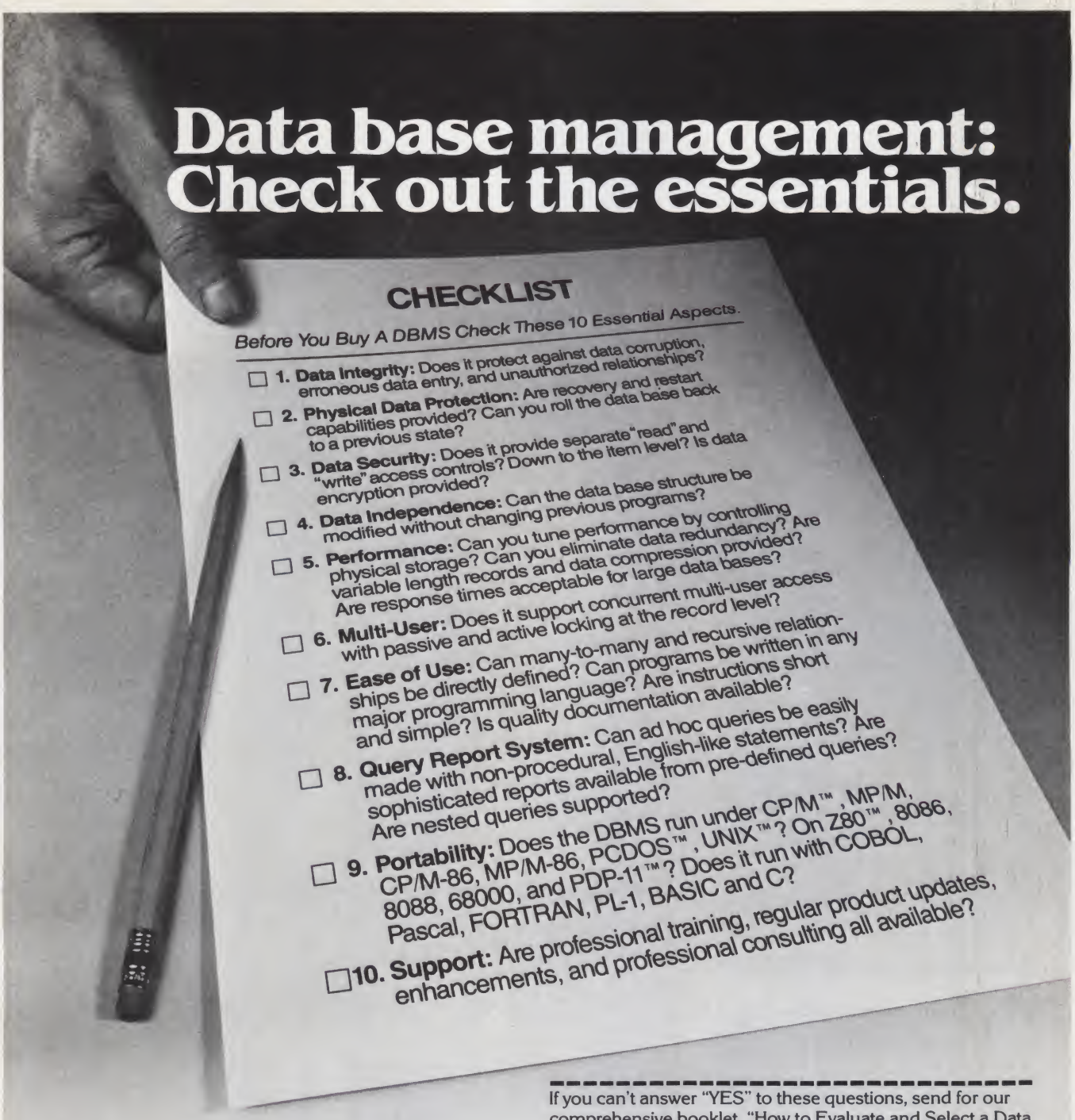
Before we proceed any further, let's define some of the terms associated with the generation of sound effects on the C-64.

- *Volume*—Entering a volume between zero and 15 will set all three synthesizers to the same volume level. A volume of 15 is standard.
- *Waveform*—The waveform is the shape of the output frequency from the computer. Each voice has its own waveform and can be set independently. There are four waveforms, and each sounds different from the others. These waveforms are Triangle, Sawtooth, Pulse (or Square) and Noise.

This parameter also is called the Control Setting. When it is properly set, the ADSR (Attack/Decay/Sustain/Release) feature also is activated.

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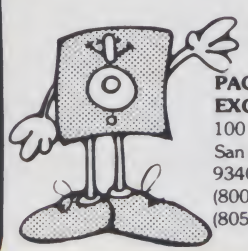
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Variable	Function
#A	Contains value for Attack/Decay
#F	Screen location of last note
#H	High part of frequency
#L	Low part of frequency
#P	Low part of pulse duty cycle
#R	High part of pulse duty cycle
#S	Value for Sustain/Release
#T	Screen location of current note
#W	Waveform for current note

Table 1. List of variables used in Listing 1.

●*Attack/Decay*—Think of the Attack as the rate at which the note or sound rises to its maximum value. The Decay is the rate at which the note or sound falls from its highest volume to zero.

There are four rates of Attack and four rates of Decay. These correspond to the eight bits of the byte used by the synthesizer to define the rates of Attack and Decay.

The following diagram might help you understand this:

Attack

High	Medium	Low	Lowest
128	64	32	16

Decay

High	Medium	Low	Lowest
8	4	2	1

You can combine Attack and Decay settings by adding up the values above. The highest Attack rate would be 240 (128+64+32+16). The lowest Attack rate would be 16. Highest Attack with Medium Decay would be 244.

Oboes and Xylophones

Different settings can sound like different instruments. For example, a triangle waveform with an Attack/Decay value of 96 sounds like a flute, while a value of 9 sounds more like a xylophone, and a value of 190 sounds like an oboe or clarinet.

●*Sustain/Release*—The Sustain value will determine how long a note or sound will stay at its maximum volume. The Release value will determine the rate at which the volume of a note is cut off.

There are four rates of Sustain and four rates of Release. These are determined just like the Attack/Decay values.

Sustain

High	Medium	Low	Lowest
128	64	32	16

Listing 1. Example of sound generation on the Commodore-64. Program is written in Vanilla Pilot from Tamarack Software.

```
100          R :** CLEAR THE SCREEN AND SET
110          R :**   BACKGROUND AND BORDER COLORS
120          R :
130          S :C
140          S :B0,0
150          S :R8
160          S :O5
170          T :COMMODORE-64 PIANO
180          S :S2
190          T :
200          S :R7
210          T :BY TAMARACK SOFTWARE
220          S :O15
230          R :*** INSTRUCTIONS ***
240          T :THIS PROGRAM WILL SIMULATE SEVERAL
250          T :DIFFERENT INSTRUMENTS. THESE ARE THE
260          T :PIANO, HARPSICHORD AND ORGAN. YOU
270          T :PLAY THE INSTRUMENT IN THE KEYBOARD.
280          T :THE KEYS YOU USE TO PLAY THE NOTES ARE:
290          S :O4
300          T :  Q  W  E  R  T  Y  U  I  O  P  @  *
310          S :O5
320          T :PRESS ANY KEY TO CONTINUE.
330          W :$
340          S :O15
350          S :C
```

More →

Listing continued

```
360             T :IN ADDITION, THERE ARE SEVERAL OTHER
370             T :IMPORTANT KEYS: THE S KEY WILL END THE
380             T :PROGRAM. THE NUMBER KEYS 1, 2, 3 AND 4
390             T :WILL CHANGE TO A DIFFERENT INSTRUMENT.
400             S :O4
410             T :PRESS ANY KEY TO CONTINUE.
420             W :$
430             S :C
440             S :B12,12
450             S :O1
460             S :D4
470             S :R5
480             T :A  A$# B  C  C$# D  D$# E  F  F$# G  G$#
490             C :W=65
500             C :P=0
510             C :R=255
520             C :A=9
530             C :S=0
540             S :H
550             T :PIANO
560             R :** CHECK FOR KEY PRESSED AND PROCESS
570             R :**  IT. IF A NEW NOTE THEN SOUND IT.
580             R :**  OTHERWISE NO SOUND.
590             R :
600 *NXTNOTE    W :*
610             M :1,2,3,4
620             UY:STVOICE
630             M :Q,W,E,R,T,Y,U,I,O,P,@,*,S
640             JN:NXTNOTE
650             M :S
660             JY:END
670             B :
680             U :MATCH
690             JN:NXTNOTE
700             B :V1,M15,W#W,A#A,S#S,P#P,R#R,H#H,L#L
710             S :O2
720             S :H
730             S :D5
740             S :R#F
750             T :
760             S :H
770             S :D5
780             S :R#T
790             T :*
800             C :F=T
810             R :** SET THE PARAMETERS FOR EACH
820             R :** THE VOICES.
830             R :
840             J :NXTNOTE
850 *END        B :
860             E :
870 *STVOICE    C :P=0
880             C :R=0
890             M :1
900             CY:W=17
910             CY:A=0
920             CY:S=240
930             SY:O1
940             SY:H
950             TY:ORGAN
960             EY:
970             M :2
980             CY:W=33
990             CY:A=9
1000             CY:S=0
1010             SY:O11
1020             SY:H
1030             TY:HARPSICHORD
1040             EY:
1050             M :3
1060             CY:W=65
1070             CY:A=9
1080             CY:S=0
1090             CY:P=0
1100             CY:R=255
1110             SY:O1
```

More →

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	Release		
High	Medium	Low	Lowest
8	4	2	1

The maximum value of Sustain (240) will cause a note to play indefinitely, much like an electronic organ.

● *High/Low Frequency*—Each note requires two values for each frequency. These values can be calculated by the following equation:

$$\text{Value} = \frac{\text{Frequency}}{0.0596}$$

$$\text{High} = \frac{\text{Value}}{256}$$

$$\text{Low} = \text{Value} - (\text{High} \times 256)$$

It is important that you take only the integer of each value. For example, the High and Low for a frequency of 440 Hz is calculated:

$$\text{Value} = \frac{440}{0.0596} = 7382$$

$$\text{High} = \frac{7382}{256} = 28$$

$$\text{Low} = 7382 - (28 \times 256) = 214$$

Simple Sample

The following example will create a single note on the C-64:

```
100 POKE 54296,15
110 POKE 54277,190
120 POKE 54278,248
130 POKE 54273,17: POKE 54272,37
140 POKE 54276,33
150 FOR DELAY = 1 TO 300: NEXT DELAY
160 POKE 54276,0: POKE 54277,0:
    POKE 54278,0
```

Let's look at this program in some detail. Note that each of the parameters (except the volume) is for voice 1.

Line 100—Sets the volume of the sound effect to the maximum value.

Line 110—Sets the Attack/Decay value. Here you can have a number between 0 and 255. The Attack/Decay value sets the slope to define how fast a note rises and falls from its peak volume.

Line 120—Sets the Sustain/Release value. Sustain/Release will determine how long the note will stay at a certain volume before releasing it.

Line 130—Frequency determination. The value can be calculated from the above equations or taken from Appendix M of the C-64 user's guide. Here the note is a Middle C.

Line 140—Chooses one of the four wave forms. Here we are using a sawtooth waveform.

Line 150—A timing loop that sets the duration of the note.

Listing continued.

```
1120            SY:H
1130            TY:PIANO
1140            EY:
1150            C :W=129
1160            C :A=9
1170            C :S=0
1180            S :011
1190            S :H
1200            T :NOISE
1210            E :
1220            R :** SET THE PARAMETERS FOR THE
1230            R :** THE VARIOUS NOTES.
1240            R :
1250 *MATCH     M :Q
1260            CY:H=14
1270            CY:L=107
1280            CY:T=5
1290            EY:
1300            M :W
1310            CY:H=15
1320            CY:L=70
1330            CY:T=8
1340            EY:
1350            M :E
1360            CY:H=16
1370            CY:L=47
1380            CY:T=11
1390            EY:
1400            M :R
1410            CY:H=17
1420            CY:L=37
1430            CY:T=14
1440            EY:
1450            M :T
1460            CY:H=18
1470            CY:L=42
1480            CY:T=17
1490            EY:
1500            M :Y
1510            CY:H=19
1520            CY:L=63
1530            CY:T=20
1540            EY:
1550            M :U
1560            CY:H=20
1570            CY:L=100
1580            CY:T=23
1590            EY:
1600            M :I
1610            CY:H=21
1620            CY:L=154
1630            CY:T=26
1640            EY:
1650            M :O
1660            CY:H=22
1670            CY:L=227
1680            CY:T=29
1690            EY:
1700            M :P
1710            CY:H=24
1720            CY:L=63
1730            CY:T=32
1740            EY:
1750            M :@
1760            CY:H=25
1770            CY:L=177
1780            CY:T=35
1790            EY:
1800            M :*
1810            CY:H=27
1820            CY:L=56
1830            CY:T=38
1840            EY:
1850            E :
```

Line 160—Turns off the Waveform control, Attack/Decay and Sustain/Release settings.

(Phew! Can you imagine programming a complex sound?)

To be fair, some of these parameters are set at the beginning of the program and then left alone.

Vanilla Pilot

Tamarack Software has made the process of generating sound on the C-64 much simpler.

For instance, Vanilla Pilot is an interpreter with commands that make generating a sound effect easy. The Basic program we just looked at would appear in Vanilla Pilot as

```
100 B:V1,M15,W33,A190,S248,L37,H17,D30
```

In Pilot, a command is given by a single letter, followed by a colon, which is, in turn, followed by the appropriate list of parameters. In this case, the B: (beep or sound command) tells the computer that what follows is a list of parameters to transfer to the sound synthesizer.

Let's look at each of these parameters. They act much like the poke commands in the Basic program, except that you don't need to remember all the addresses for the pokes.

- V—Selects the voice to be used by the sound. Can be either 1, 2, or 3.
- M—Sets the volume at the maximum value.
- W—Selects the waveform; in this case, the sawtooth.
- A—Sets the attack/decay parameter.
- S—Sets the sustain/release parameter.
- L,H—The low and high bytes of the frequency of the sound.
- D—Delay parameter in units of 1/60 of a second. Thus, the sound, in our example, will continue for about .5 seconds.

By varying the frequency of the synthesizer, the waveform and the ADSR parameters, you can easily duplicate the sound of almost any instrument. Indeed, an organ, electric piano or harpsichord can be available with the computer keyboard used to make music. Plug the computer into a good stereo sound system and you'll be certain that it's the equal of a synthesizer costing many times the computer's modest price.

Sounds—Other Than Music

Of course, the capabilities to make music can be used to make realistic sound effects as well. A gunshot sound can be synthesized in Basic like this:

```
100 FOR VOLUME = 15 TO 0 STEP-1
110 POKE 54296,VOLUME
120 POKE 54276,129
130 POKE 54277,15
140 POKE 54273,200: POKE 54272,40
150 NEXT VOLUME
160 POKE 54296,0:POKE 54277,0
```

The same sound can be made in Pilot like this:

```
100             C:I=15
110             C:E=0
120 *SHOOT      B:V1,W129,A15,H40,
                  L200,M#I
130             P:2
140             C:I=I-1
150             C:$=I
160             M:#E
170             JN:*SHOOT
180             B:
190             E:
```

Following are explanations of the seven Pilot statements in this short program.

- C—Compute. This means that following the colon, there are some arithmetical expressions that need to be evaluated.
- B—Beep. This was discussed earlier. Note that the volume here (M) is a variable in line 120. And note that a beep without parameters, as in line 180, will turn off the synthesizer.
- P—Pause. This will delay the execution of the program for intervals of .021 seconds.
- M—Match. Match the contents of the answer field with whatever follows the colon. In this case, we wish to match variable I with variable E. If there is a match, then we set a flag to Yes; otherwise, it's set to No.
- J—Jump. This transfers control of the program to the label following Jump. In this case, it's conditional; the jump command will be executed *only* if the variable I does not equal variable E.
- E—End. This is optional in most cases in Pilot. It simply says this is the end of this program.

Listing 1 provides a more complete musical instrument program written in Pilot. The program is a simple, one-octave synthesizer with the organ, electric piano, harpsichord and shooting sound. If you have a C-64 and a copy of Vanilla Pilot, type it in and try it. Otherwise, study the listing; it demonstrates several useful techniques for C-64 sound effects.■

For more on the C-64's sound-making capabilities, see the March 1983 Microcomputing, *pp. 102–104, "Commodore Launches a Winner," by Robert Baker.*

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Like the Osborne 1 and Kaypro II, it comes with its own set of software packages for word processing, spreadsheet applications, Basic programming, and data management. A menu-driven software package designed to guide the inexperienced user through the most commonly used options of CP/M is included.

The Micro Decision talks to the outside world via two RS-232C serial ports on the back—one for the terminal and one for a printer or modem. In addition, there's an auxiliary RS-232C serial printer port on the back of the monitor. There is, however, no parallel port and, like the Osborne and Kaypro, no expansion capability.

Morrow's offering has basically the same capabilities as other Z-80 systems in the same price range, but there are a few interesting features

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The Disk Drives

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Foreign-drive-emulation lets users overcome one of the biggest problems in the world of microcomputers—the jungle of disk drive formats. (Emulate, in this case, means the capability to read and write on disks that have been formatted on other systems.) The Micro Decision can emulate disk formats from three other micros: Osborne 1, Xerox 820 and IBM PC under CP/M-86.

To change format, simply run one of the disk-emulation programs provided (OSB.COM, XER.COM or IBM.COM). For example, to make drive B an IBM drive, enter IBM B: after the CP/M prompt. The system will respond: "Disk Drive B: is now an IBM drive." To return the drives back to Morrow format, either execute MORROW.COM or press the reset button. Morrow is working on additional conversion programs, including the Osborne and Kaypro double-density formats.

The second unique feature of these drives, virtual drive capability, allows you to simulate the use of up to 26 disk drives at the same time. If you select a drive other than those physically connected, the system will reassign drive A as the new drive. For instance, if you ask for drive E, the system will pause and display the message: "Your left-hand drive is being reassigned as drive E. Exchange diskettes and press Return."

While this feature would be useful especially for single-drive systems, it can come in handy regardless of the number of drives attached.

An example in the manual best illustrates this. Suppose you are in WordStar and are about to save a document, but you're not sure if there is enough room on the disk to store it. Since WordStar does not allow you to swap disks without returning to the starting menu, the text you have created would normally be in jeopardy.

With the virtual disk capability, though, you have an alternative. You can mark the top and bottom of the

A Capsule Look At Micro Decision

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List Price
$1990 (for complete system, with two single-sided drives).

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Software
(Supplied with system) CP/M 2.2, Microsoft Basic, WordStar, Correct-It, LogiCalc, BaZic, Personal Pearl, Pilot.

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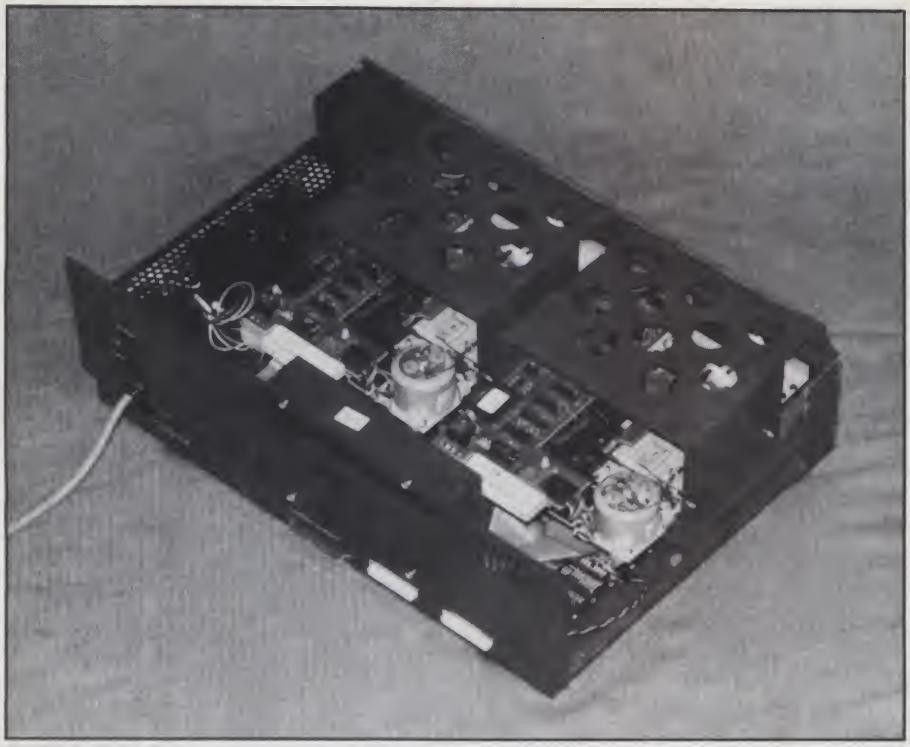
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Inside view of the computer shows two disk drives and the power supply. Processor and memory are below the drives.

document (ctrl KB/ctrl KK), execute the Block Write command (ctrl KW), enter the document name on a nonexistent drive (ex: E:Document), wait for the message, load a new disk into drive A, then press return. The document would be saved on the new disk.

You also can combine the virtual disk and disk-emulation capabilities. The entry XER C: would make drive A: emulate a Xerox drive in the virtual mode.

The Terminal: A Lear-Siegler ADM-20

The terminal that comes with the Micro Decision is a Lear-Siegler ADM-20, and it's supported only by Morrow Designs. (Note: Due to higher-than-anticipated demand, some Micro Decisions have been shipped with the Freedom 100 terminal in lieu of the ADM-20.)

The ADM-20 consists of a monitor with an easy-to-read, 12-inch, nonglare, green phosphor screen and a detached keyboard. Characters are generated using a 7×11 dot matrix within a 9×12 dot field; they include true lowercase descenders.

Monitor controls include a brightness knob and an on/off switch. The keyboard, an IBM Selectric-type, is connected to the monitor with a six-foot coil cord.

The keyboard's 92 keys include a 14-key calculator keypad, eight cursor-control keys, seven programmable function keys and four editing keys. All keys have autorepeat capability at 15 cps. A built-in self-test function is automatically initiated whenever the terminal is powered up.

Features of the monitor include dual-intensity, reverse video, underlining and blinking. The cursor can be set either as a block or an underline, and can be made either steady or blinking.

These features are controlled by two keys—Set-Up and Save. Set-Up gets you into the configuration mode by displaying 36 set-up bits in nine groups of four each, plus an equal sign on the 25th line at the bottom of the screen. The 37 switches control features such as baud rate, terminal emulation, key click and parity.

These switches are modified by moving the cursor down the row (using the right or left arrows) and pressing the up arrow to change state. Once the desired functions have been selected, press the save key to complete the setup. Set-Up and Save can be used at any time, even while you are running an application program. This enables you to reconfigure on the fly.

Although the terminal has many desirable features, some are not as convenient to use as they could be. This is because of the way they are set up and invoked.

For instance, the reverse video, blinking and underline features all are invoked with the same programmatic input. Therefore, you can't use different features at different locations on the screen at the same time. Use either all of the features that have been set up or none.

Another problem concerns the bell; it can be used only if you have set up the margin bell feature. It can be a little distracting, however, since the margin bell beeps every time the cursor passes through column 73.

The terminal can be put into normal, graphics and monitor modes, but Morrow does not advertise the graphics mode because it is inconvenient to use.

The problem lies in the fact that, while you can enter the graphics mode by sending programmed commands from the computer to the terminal, you cannot get out of it the same way. The only way to get back to normal is to turn the power off or hit the reset button; both of these actions force you to end any program that happens to be running at the time.

On terminals that have serial numbers greater than 25220000, the edit keys (character insert/delete and line



The keyboard is full-size and has 92 keys.

insert/delete) have been configured to transmit the appropriate WordStar codes. This could be an advantage if you intend to do some serious word processing.

If you've already bought a Micro Decision and would like to have the WordStar feature, there is hope. Terminals with serial numbers between 25110000 and 25220000 can be modified to add this capability.

One of the advantages that results from the Micro Decision's design to be used with a smart terminal is that the terminal has its own screen memory. This means that the 2K needed for the display does not come out of the 64K of RAM in the computer. When you load Microsoft Basic, for instance, you have 32,824 bytes of memory available.

Software

The Micro Decision, like the Osborne 1, which started the trend, comes with its own set of software packages. In this case, the packages include CP/M 2.2, Microsoft Basic, WordStar, Correct-It, LogiCalc, BaZic, Personal Pearl and Pilot.

The first three are standards and need no explanation. The remainders, on the other hand, are not as well-known, and probably need an introduction.

Correct-It is a spelling checker, designed to work not only with WordStar files, but with any ASCII file. It comes with a 36,000-word main dictionary and a program to modify that dictionary or build auxiliary ones. Users can interactively correct errors after they have been detected.

LogiCalc is a spreadsheet program—similar to CalcStar—with up to 32,385 memory locations (255 rows by 127 columns). It's menu-driven and has a handy help function for quick reference.

BaZic is a NorthStar-compatible, high-level Basic interpreter that allows execution of NorthStar Basic programs without modification. The manual claims that it has much faster execution times than Basic and increased power through the addition of new statements and functions. These include user-defined functions, commands to determine the status of input/output devices, and a Print@ command for direct cursor-addressing.

Personal Pearl is an information manager that allows the user to design forms, store and retrieve data and produce reports. Output from this package can be read by LogiCalc and WordStar.

Pilot is a programming language designed for teaching; it's used by Morrow to create its CP/M "Micro Menus." These menus are designed for the microcomputer user who is still confused by the secrets of the operating system.

To use the Micro Menus, load the CP/M system disk into drive A and boot the system. On the first screen, you'll be presented with The Micro Decision Micro Menu, a listing of the most commonly used CP/M options.

If you select any of the options, you'll be presented with a second menu, which further explains how to use the command. The initial versions of these menus lacked sufficient error-checking, and they produced errors if the input was not correct. Morrow says these problems have been corrected in version 1.5; owners of previous versions should contact their dealer for the new release.

The menus are booted automatically through the use of an autostart program (AUTO.COM). Any program can be set up to boot automatically by loading the appropriate disk, entering "Auto filename," then hitting return.

The name could also be that of a CP/M submit file to initiate a sequence of events upon boot-up, or a WordStar-prepared documentation file that would give instructions to the user. Both would be useful in developing a custom turnkey application.

To eliminate the autostart, simply enter "Auto," then return. The experienced CP/M user might consider this to turn off the menus.

Documentation

The looseleaf user's guide contains all of the instructions needed to get the system up and running. It's clear, easy to understand and designed for the individual who knows little about computers. Instructions are detailed enough for the novice and organized enough for any user to find what he needs easily.

The guide also contains instructions for LogiCalc, Correct-It and BaZic. Documentation for CP/M, Microsoft Basic, WordStar and Personal Pearl are contained in separate paperback books.

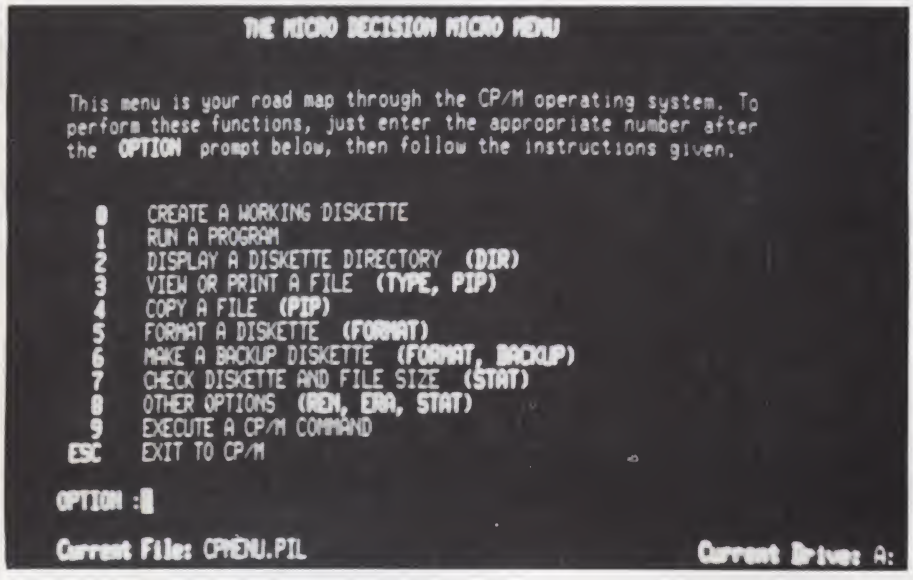
The Pilot reference manual currently is being written and is expected to be released shortly. Units sold prior to mid-January 1983 did not include a reference manual for the terminal. Only a limited sheet of set-up instructions was included. This omission was corrected with the release of a new manual in January. Owners who did not get a copy should contact their dealer.

Winding Up

The Micro Decision has several significant strengths: its price, the professional capabilities of the terminal, the bundled software and the disk-drive emulation.

The software that comes with the computer makes it an excellent buy. Foreign-drive emulation and the virtual disk function give it capabilities that few others have, and the display is of high quality.

Overall, the Micro Decision is an ideal system for small-business and personal computing and text and data processing applications.■



The main menu of the micro menus shows the CP/M functions covered.

Zorba the Portable

The Zorba portable computer lets you experience the* joie de vivre *of computing while filling the need for compatibility, transferability and transportability.

By Kenniston Lord

The expansion of the portable computer marketplace has been spectacular. By and large, the marketplace was created by the Osborne 1, and the pages of this and other magazines document a steady parade of new items of equipment and facility.

The market does not yet seem saturated, and each potential entrant seems to try to do its predecessor one better in hardware, software or both. Bit by bit, the price of everything will come down to the point of reason.

The public, spurred by the aggressive advertising of a few of the players, continues to purchase microcomputers simply to have them. A second microcomputer market is emerging, one that has portability as a predominant feature.

While the desire for portability is large, the *need* for compatibility, transferability or at least transportability may be larger. Telcon Industries' Zorba provides these capabilities.

Processor and Software

The Zorba, otherwise a standard Z-80 CP/M offering, provides a unique disk transportability feature—disks that can be read by a number of other CP/M machines.

While Telcon has a bit to learn about useable and workable documentation, the hardware, priced at $1995, is worth considering. Although it costs slightly more than other portable computers, the difference in price is insignificant when compared to the advances Telcon has made in capability.

The Zorba is more of a CP/M assembler programmer's machine than a user's machine. And it appears that Telcon has structured the system's documentation with this in mind.

The unit uses a Z-80A (eight-bit, 4 MHz, no wait-state) and has 64K of RAM. The package includes the CP/M operating system, WordStar, CalcStar, MailMerge, M-80 utilities and communications software.

A decision has not been made, as of this writing, about offering MBasic. SpellStar and InfoStar are available for an additional fee.

Computer in a Bucket

The Zorba is built into a vinyl bucket; when complete, the package is watertight, compact and lightweight (22 pounds). The bucket has two folding-pedestal legs (attached to one side) that will slant the unit (sans keyboard) upward for ease of viewing.

Ports for the attachment of printers, communications devices and additional peripherals are easily reached at the rear of the unit (which is the top of the closed package, near the carrying handle, but recessed and covered). This means that it's not necessary to cope with printer cables draping over the top or threading beneath the unit.

A caution: Telcon has made what may be a critical mistake. All female cable sockets are identical, making connection of the printer cable to a source of high voltage (such as the communication port) possible. It happened to me, and the resulting destruction cost $150.

I should have known better, but what about the purchaser who has little technical knowledge? Telcon has been advised of the problem and has indicated that notification will accompany the machine. A more suitable solution would be the differentiation of the port connections.

Punching Keys

The keyboard is the bottom of the



Telcon's Zorba has a 95-key keyboard packed in a 22-pound folding case.

Address correspondence to Kenniston Lord, 45 School St., Winchendon, MA 01475.

closed package and lies flat when disengaged. It has a nice touch and can handle speed typing. There are 19 independently programmed function keys (capable of up to 55 user-programmed functions). One of those keys is enlarged for ease of location; three are lighted and are used as toggles (e.g., to keep track of the status of the communication port).

The WordStar package, which accompanies the computer, does not use the function keys directly, but the function keys may be assigned to WordStar. Telcon plans to provide templates for WordStar and other software packages, giving the user the option to determine how best to use the function keys.

The keyboard has the standard features—the typewriter board, the numeric keypad, the cursor arrows... The control characters are nicely grouped, largely at the left side of the keyboard. (The keyboard supplied by Telcon for review differs slightly from the photo, an early release.)

On the unit itself, the escape, caps lock, return, backspace and shift keys are white. In view of the fact that WordStar makes such heavy use of the control key, changing that key to white would also be a wise move by Telcon. There's no doubt as to the location of the return key. It's clearly marked and of a unique shape.

Looking at the Screen

Zorba has a seven-inch etched, nonreflective green phosphor screen with high resolution. It conveys 25 lines of 80 characters in high relief (adjustable with the on/off switch).

The system is also capable of line graphics of at least two densities. The screen and the disk drives are mounted in the face of the unit, recessed into the bucket. The on/off/contrast and reset buttons are near the screen.

The unit is fan-cooled. Air intakes surround the screen; air is circulated around the disk drives and then blown from the unit by the fan, which exhausts at the right side of the unit. I find the movement of air to be a little disconcerting. Telcon should consider installing a slanted louver at the fan exhaust to push heated air away from the user.

Disk Storage

The disk storage and format capabilities are the most unusual characteristics of the Zorba. Each disk unit is rated to provide 400K of nonvolatile, single- or double-density memory.

Zorba is 40-track capable. Nomis, another of Telcon's machines, uses the same equipment in an 80-track capability. Telcon has recognized the need for transportability to be designed into the system, providing formatting capabilities that will prepare disks to work with a variety of other microcomputers.

As of this writing, disk emulation is available for Telcon double density (DD), DEC VT18X, Xerox 820 single density (SD), Cromemco 520 (SD), Xerox 820 II (DD), Kaypro (DD), Osborne (SD), IBM PC (CP/M-86) and Televideo. Terminal emulation for these systems, as well as for the Zenith H-19, is also provided. And software to emulate 12 other terminals is available from Telcon.

All this is done within the confines of the CP/M operating system, which allows Telcon to address much of the computing market. As of this moment, Telcon has chosen not to address the MSDOS market.

The disk drives are quiet enough, and Telcon's choice of pressure-re-

A Capsule Look At Telcon's Zorba

Manufacturer
Telcon Industries, Inc., 1401 N.W. 69th St., Fort Lauderdale, FL 33309-1186; phone 305-971-2250.

Base List Price
$1995.

Standard Features
Unit is self-contained in folding case; Z-80A microprocessor; 64K RAM and 16K ROM; two 400K single- and double-density floppy disks; detachable 95-key keyboard; 19 independent function keys; communication, printer, IEEE and eight-bit parallel ports; high-resolution, seven-inch 80×25 green display.

Proportions
System weighs 22 pounds and measures 17.5×9×16 inches.

Popular Options
Centronics parallel cable with connector; softcover case; composite video option.

Systems Software
CP/M 2.2 operating system, including utilities; M80, (including L80, LIB80 and CREF80); source code of the Bios plus any other Telcon-supplied utilities; data communication set-up package; modem communication package.

Applications Software
CBasic, WordStar, MailMerge, CalcStar.

Circle 67 on Reader Service card.



leased drive covers keeps them from being opened until the motor is off, minimizing the risk of disk damage.

While the drives themselves are quiet, the noise of the switching mechanisms used when moving from drive to drive might be disconcerting.

The amount of time a drive remains selected (and the jewel is illuminated) after a disk-oriented command has been completed might seem annoying—it's only six seconds. Again, the reason for having it that way is valid—on disk-to-disk operations or repetitive disk operations, speed may be gained by avoiding the start/stop/start cycle at the disk drive.

Eight-inch drives may be connected to the system, allowing the transferring of programs and data to the smaller media. By the time this is published, even more horizontal compatibility will have been added to the product.

Telcon may well be limiting its market by its emphasis on the Zorba as a programmer's machine. To this point Telcon has been successful enough to build a multimillion-dollar backlog of orders. But those orders are probably from individuals with assembly-language orientation, rather than the nonprogrammer whose interest is more in using it for accounting or other office duties.

In anticipation that you may wish to alter some of the CP/M software, Telcon has provided the source code for the CP/M input/output control system (which is referred to as the "Source of the Bios").

For the programmer familiar with Z-80 assembly language, this is a nice feature. Many users, however, couldn't care less. They would rather have the MBasic. MBasic is available for the machine but is not, at this writing, part of the marketed bundle.

Telcon is being nonspecific about its marketing plans for MBasic. For the majority of prospective purchasers, I would recommend MBasic over the "Source of the Bios," although in so doing I must declare a bias.

Technical

System materials included with the Zorba include elements from Digital Research's CP/M 2.2, Microsoft's utilities and Basic, and Telcon-supplied programs and source code files.

CP/M 2.2:

- ASM.COM—8080 Assembler, .HEX output.
- DDT.COM—.COM file debugger.
- ED.COM—Source File Editor.
- LOAD.COM—Generates .COM file from the .HEX file.
- MOVCPM.COM—Makes CP/M system image in memory.
- PIP.COM—File transfer utility.
- STAT.COM—File attributes and status ability.
- SUBMIT.COM—Batched command processor.
- XSUB.COM—Extension.
- DUMP.COM—ASCII file "hex dump" utility.

Microsoft "Utilities" and Basic:

- M80.COM—8080 or Z-80 macro assembler, .REL output.
- L80.COM—Linker for .REL files, generates .COM files.
- CREF80.COM—Cross-reference utility for M80 assembler.
- LIB80.COM—.REL file librarian.
- CBAS2.COM—CBasic compiler language.
- CRVN2.COM—CBasic compiler language.
- XREF.COM—CBasic compiler language.

Telcon-supplied Programs and Sources:

- SGEN.COM—SYSGEN.COM replacement; copies disk "system."
- PATCH.COM—Run to install system patches.
- PATCH.Z80—Source code for PATCH.COM.
- SETUP.COM—System configurator program.
- SETUP.Z80—Source code for SETUP.COM.
- FORMAT.COM—Universal disk formatter.
- FORMAT.Z80—Source code for FORMAT.COM.
- TRACKRD.COM—Special disk-reading program for engineers.
- TRACKRD.Z80—Source code for TRACKRD.COM.
- RELOAD.COM—Utility for Bios generation.
- SYSEQU.Z80—Part of Format, Setup and Patch source files.
- CPMBIOS.Z80—CP/M Bios source file.
- CPMEQU.Z80—Part of CP/M Bios source file.
- GEN.SUB—Submit procedure for Bios generation.
- GEN2.SUB—Part of GEN.SUB.
- KEY.MAC—Keyboard PROM contents; can be assembled.
- CPMBOOT.Z80—Monitor PROM contents; can be assembled.
- DISK.DOC—Explains files on disk.

The decision to provide so much source code is a reflection of Telcon's assessment that its market is among engineers and assembly-language specialists. Again, if you ever need the capability, you at least have it—assuming that you know what to do with it.

User Interface

The Zorba may be a technician's dream—and a user's nightmare. The machine is fast, but how fast does it need to be? The WordStar operator cannot type as fast as the machine can accept the text. The CalcStar operator has no great interest in speed. This machine's primary orientation is technical, unless Telcon recognizes that it has severely limited its market in this manner.

To the end they have chosen, Telcon has implemented CP/M 2.2 and has accompanied the machine with the usual ten pounds of technical literature. If the prospective nontechnical purchaser judges the machine on the strength of the documentation, Zorba will not make the sale.

The documentation, while appearing to be accurate and complete, is dry and dull. When the user is told that the application program is something that can be developed quickly or that it can take many years, bye-bye user. Take the novice user and place under his nose the intense documentation of the "innards" of CP/M, complete with Assembler instructions, memory maps, macro calls, Macro-80 coding and CBasic instruction, and he'll go buy something that he can simply turn on and use. Telcon must market its entire offering, not just part of it.

With the documentation presented for review, there was absolutely no instruction on WordStar, CalcStar or anything other than those things of interest to the technical person. Telcon must work on tutorial materials for all application packages. Despite its protestations to the contrary, CBasic is *not* that easily assimilated by a novice user. CBasic may mean "compiled" Basic, but we all know that it really means "Consultant's Basic."

Zorba and its other microcomputer-based products (Nomis-9, Nomis-12, GC-100, VCS-780 and a variety of other communications-based interface gear) will make an impact on the burgeoning portable-computer market. How large an impact it will make will depend on the focus applied by Telcon in the upcoming months.

Revamping the materials for the user, rather than the programmer, may make the difference.■

BASIC vs. JRT PASCAL:

A NO-HOLDS-BARRED COMPARISON.

EASE-OF-USE By dividing programs into modules, JRT Pascal makes even very complex programs—of nearly any size—a breeze to manage. Pascal code is *self-documenting;* program sections are identified by meaningful names, not line numbers. Error messages are verbal, not number codes. JRT offers *12 data types* (to Basic's 2 or 3), and it has both regular and hex numbers.

POWER For power—the ability to write better, clearer programs, faster—Pascal is the run-away winner. Example: JRT simplifies programming by accomplishing complicated operations (for Basic) with one command:

Basic	JRT Pascal
IF A$ = "V" OR A$ = "W" OR A$ = "X" OR A$ = "Y" OR A$ = "Z" THEN...	IF A IN ['V'..'Z'] THEN...

FLEXIBILITY JRT's wide variety of data types reduces programming restrictions. And the data types are not all fixed in size. There are *3 looping statements* (Basic has 1). With JRT, very large programs can be created and run, because program modules can be spread over many diskettes. Common modules can be used for several programs. Basic generally limits strings to 255 bytes; *JRT strings go up to 64K.*

EFFICIENCY Whereas Basic relies on a static, inefficient memory map to allocate storage, JRT's *dynamic storage* fills every available main storage area; there's no waste. With Basic, sub-routine modules must be linked together; with JRT, they can be linked—but don't have to be. JRT's more powerful commands run faster; typically, you'll *write Pascal programs 3 to 10 times faster* than in Basic. *Exclusive:* JRT lets you directly access the CP/M* operating system for better total system control.

NOW... Consider our copy policy. (If you want to make copies, it's OK with us—so long as they're not for re-sale.) Check our astounding price: **$29.95!**—and *satisfaction is guaranteed—or your money back.* Basic versus JRT Pascal: which comes out on top? Right! The coupon below is for your convenience. Or call. Today.

Here's the real shocker!

Features	Basic	JRT Pascal
Structured programs	No	Yes
Separate compiled modules	"Chaining"	Structured procedures with auto-loading & purging
Arithmetic precision	Usually 6 or 7 digits	14 digits
Indexed files	No	Yes
Maximum string size	255 characters	64,000 characters
Loop statements	1	3
Data types	Usually 2 or 3	12
CASE statement	No	Yes
Introduced	1965	1980
Price	???	$29.95!



- Full support for indexed files
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- Facilities for formatting printed reports
- File variables & GET/PUT
- Dynamic arrays
- SEARCH procedures for fast table look-up
- Extended CASE statements
- Random files to 8 megabytes with variable length records
- 64K dynamic strings
- Graphing procedures
- Statistic procedures
- Activity analyzer prints program use histogram
- 14 digit BCD FLOATING POINT arithmetic
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- Advanced assembly interface
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- Efficient compiler needs only 85K diskette space
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- More than 200 verbal error messages
- Separate compilation of auto-loading external procedures
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- Handy JRT Pascal reference card

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or phone **415/388-0530**

Here's my $29.95; please send me JRT Pascal. I understand that if I'm not completely satisfied, I can return it within 30 days—with the sealed diskettes unopened—for a full refund.

I need the 5-1/4" diskettes for ☐ Apple CP/M; ☐ Heath, Hard Sector; ☐ Heath, Soft Sector; ☐ Northstar; ☐ Osborne; ☐ Superbrain; ☐ Televideo; ☐ Xerox 820. **I need ☐ 8" SSSD diskettes.**

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Address _____

City _____ State _____ Zip _____

☐ Check ☐ C.O.D. ☐ MasterCard ☐ VISA
(CA residents add sales tax. Add $6 for shipping outside North America.)

Card # _____ Exp. _____

Signature _____

*CP/M is a Digital Research TM. A 56K CP/M system is required.

A Real-Time Compiler System

The sometimes difficult relationship between microcomputers and compilers may soon improve. This hardware/software approach should work with nearly all languages and computer systems.

By Martin Reiffin

This is a new real-time compiler system for microcomputers.

By "real-time," I mean that the compiler analyzes and translates source code into machine code concurrently as the programmer types in the program at the keyboard. The idea is to eliminate much of the drudgery of programming in a compiled language, such as Pascal, C, Fortran or PL/I.

The following description explains the theory of the system and how it can be implemented on any micro using a microprocessor with interrupt capability. (The system status is patent-pending; it is not yet available to the end-user market.)

I have implemented the system on two S-100 computers: A Godbout system and a CCS/Cromemco system, using the keyboard interrupt scheme.

Background

Since humans write programs in programming language and computers execute only machine language, it's often necessary to translate from one language to the other.

When the programming language is high-level (that is, abstract in the sense that it does not explicitly manipulate the computer registers and other hardware), the translation of the original program is performed by other programs, called compilers or interpreters. The original program is called the source code, and the resulting program translation is called the object code.

In addition to translation, the compiler also must perform lexical, syntactic and semantic analyses of the source code.

Lexical analysis is performed by a scanner and is the process by which a sequence of source code bytes are formed into meaningful symbols or tokens—in the same way that a sequence of characters is formed into English words. These symbols are then analyzed by a parser to determine if they are arranged in a relation that conforms to the rigid grammatical rules, or syntax, of the programming language.

The semantic analysis determines if the symbols conform to still other rules not conveniently expressed by the language grammar.

Performing these analyses is comparable to parsing the words of an English sentence. If the sequence of symbols violates a syntactic or semantic rule, an error has been committed and the compiler must inform the programmer with an error message.

After translation, the compiled object code usually is linked and loaded—joined with other object code modules to form a complete machine-code program that can be executed by the computer.

Description of the Prior Art

In recent years, the increase in software costs, the lack of skilled programmers, the expansion of the computer market and the under-utilization of much available hardware has hastened the adoption of high-level languages and concentrated efforts to make their use more efficient.

However, programming in a high-level language is still slow, tedious and inefficient. For example, a compiled language requires a repeated sequence of steps: loading the editor, writing or editing the source code, loading the compiler, executing the compiler, loading the linker, executing the linker, running the program and repeating the sequence when errors appear.

During much of this time, the programmer waits for completion of the loading or execution steps, and this waiting is both wasteful and boring. As a result, the programming process is slow and expensive.

It is generally accepted that the output of the average professional programmer is only about five to ten lines of debugged source code per day.

The recent widespread use of microcomputers has compounded the programming problem. Most users presently writing programs for micros are not professionally trained as programmers. They are unwilling to spend time and effort programming in a compiled language with present microcomputer systems.

Instead, the majority of personal computer programmers use Basic interpreters.

A Basic interpreter is syntactically sparse, cryptic in revealing errors, incapable of using local variables, incapable of passing parameters to subroutines, unable to invoke subroutines by name, incapable of linking library modules and lacking in both data structures and flow-control structures. This makes it difficult to write error-free programs for any but the simplest applications. Basic, therefore, is regarded as a poor vehicle for learning good programming technique.

These Basic interpreters are also too slow for many applications.

Nevertheless, the mechanics of compilation with present microcomputer systems are so inconvenient that Basic interpreters dominate the field.

Prior Schemes

Numerous attempts have been made to minimize the disadvantages of conventional compiler usage. One such scheme is the so-called "incremental compiler." As each line of source code is entered at the console, it is analyzed for syntax without consideration of

Address correspondence to Martin Reiffin, 27 E Gate Road, Danbury CT 06810.

the context of the entire program.

If the line is error-free, the programmer can enter the next line of code. Otherwise, an error message is displayed and the error must be corrected before further lines are entered. After the entire program is entered, it undergoes further syntactic and semantic analyses with respect to the context-dependent rules, after which code generation and execution may take place.

The incremental compiler scheme has some merit when used with those languages that have few context-dependent restraints, such as Basic. For modern structured languages, such as Algol, Pascal, PL/I, C and Ada, the limited local analysis that can be performed after entry of each line is a relatively small portion of the total analysis required and is not worth the overhead.

Another well-known scheme is "repeated recompilation." In this approach, the syntactic and semantic analyses after entry of each line include all context-dependent rules and consider the entirety of the partial program entered to that point.

Therefore, upon editing even a single byte of the source code, the entire source file must be recompiled from the beginning. Since this recompilation must be completed before new lines may be entered, the large overhead of this scheme prohibits its use with any but the smallest programs.

In an effort to avoid the overhead of complete recompilation, a number of schemes of partial recompilation have been devised. These schemes generally involve a complex data structure for the source code and/or a complex editor.

Programmers having sufficient expertise in the particular scheme being used may make a change in the source code requiring only a recompilation of the changed portion. These approaches require an excessive amount of computer memory and/or highly specialized skill of the programmer.

These schemes have had no use except as experimental curiosities in academic research. Commercially available compilers still require the repeated sequences of the load, edit, load, compile, load, link and run steps as described above.

Object of the Invention

The ideal computer architecture for programming should have the following characteristics:

- The compilation should be performed in real-time as the source code is entered or edited by the programmer.
- The system should be capable of implementing a modern block-structured language having a powerful syntax, such as Algol, C, Pascal or PL/I.
- There should be no waiting for disk accesses during program writing, editing or compilation, except to the extent necessary for initial entry or saving of source files.
- An error message should be displayed instantly after a syntax error is entered at the console.
- Correction of source code errors should be fast and easy, without reloading the editor, source file or compiler.
- Compilation should be finished almost instantly after the last line of an error-free source program is entered.
- The compilation should be complete in that no further syntactic or semantic analysis is required, and the absence of an error message should assure that the program has no errors.
- The programmer should be able to stop execution of the object code at any time, examine the values of all variables and continue execution, all without requiring the prior insertion of write statements, breakpoints or other debugging code into the source program.
- The architecture should not impose any additional requirements of unique language syntax, complex editor mechanics or scheme-specialized programmer expertise.

The primary object of my invention is to provide a novel computer system that closely approaches this ideal architecture.

Summary of the Invention

The following is a summary of a preferred embodiment of my invention.

The programmer invokes the real-time compiler-editor system by typing its command file name at the keyboard console. The command file containing the software portion of the system is then read into memory from a disk. The source buffer—a memory region that will contain the source code—is initialized so that its first stored byte is a predetermined code, which will be called a Pause Mark.

Execution of the compiler then

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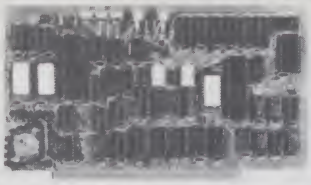
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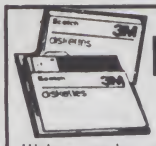


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begins by reading the Pause Mark as the character in the first location of the buffer. When the compiler reads the Pause Mark, it will enter an infinite loop, repeatedly reading the same location until the content of this location is changed by the editor to a blank space.

When the programmer strikes a key on the console keyboard, the central processor unit (CPU) executes the following interrupt sequence (described for an 8080 or Z-80 microprocessor): upon completion of the instruction currently being executed, the processor enters the interrupt mode and communicates its new status to the system by emitting an interrupt acknowledge signal.

Upon receipt of this signal, the interrupt hardware gates an RST instruction onto the data bus. The processor then executes the RST instruction, which is a one-byte call to a selected location in low memory where a jump ("vector") to the interrupt service routine comprising the editor is stored.

The interrupt service routine first saves the stack pointer and other CPU registers. If the struck key corresponds to an alphanumeric or other noncontrol character, it is placed into the second location of the source code buffer immediately after the Pause Mark. The buffer pointer is then advanced to the next location, the CPU registers are restored, the CPU interrupt is enabled and the Ret instruction is executed to return control to the compiler.

The compiler continues to execute its infinite loop in which it repeatedly reads the Pause Mark character in the first location of the source code buffer. This sequence is repeated as the programmer strikes additional keys at the keyboard; the successive characters are entered into successive locations in the source code buffer as the buffer pointer advances. This sequence continues until a key corresponding to a control character is struck.

If this control character is a carriage return, the corresponding ASCII code (13) is inserted into the buffer, the buffer pointer is advanced, the Pause Mark code is then inserted into the buffer location adjacent to the carriage return code, and the original Pause Mark code in the first location is replaced by the ASCII code (32) for a blank space.

The Pause Mark location thus has been advanced from its original point to the end of the first line of the source code.

Upon return to the compiler from the interrupt service routine, the compiler pointer accesses the first buffer location and reads the code for a space instead of the Pause Mark. The compiler then will advance its pointer repeatedly to the next buffer location and perform its lexical, syntactic and semantic analyses on the first line of source code stored in the buffer.

The compiler may either display an error message or emit compiled object code, as is appropriate, until the compiler pointer reaches the new Pause Mark inserted at the end of the first line of source code.

When it reaches the new Pause Mark, the compiler again enters an infinite loop, without advancing the pointer, until the editor eventually moves the Pause Mark to the end of the next line, whereupon the compiler is free to compile this next line of source code.

Control characters other than a carriage return may be entered by striking appropriate keys to perform the conventional editing functions of a screen editor. For example, errors in the present line of source code may be corrected by moving the cursor backward. This does not affect the compiler, which cannot advance beyond the Pause Mark at the end of the previous line.

However, if by hitting the appropriate control key the cursor is moved up one or more lines to a position before the Pause Mark, a Recompile Flag is set so as to enter a recompile mode. In this event, upon return to the compiler, the latter is reinitialized so that it may recompile the source code from the very beginning of the source buffer. Subsequent editing or text insertions cause the editor to move the Pause Mark to an updated location, adjacent to the end of the line preceding the most recently edited line.

When the compiler finds a syntax error in the source code, it displays an error message. The programmer may then edit the source so as to correct the error. Upon return from the editor, the compiler is reinitialized to recompile the source code.

The entered source code and emitted object code preferably are stored in memory so that disk accesses will not unduly interfere with the editing and compilation processes. If the source or object code buffer gets filled, its contents may be stored in a disk file in the conventional manner employed by editors and word processors such

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as CP/M ED and WordStar. The use of bank-select memory schemes or the advent of 16-bit microprocessors—with their larger addressable memory space—will obviate the need for disk storage until the compilation is finished.

Detailed Description

The details of this invention are illustrative of one of the many forms it may take in practice. The invention and novelty reside in neither the hardware nor the software taken separately, but rather in combination of both.

The major hardware components of the overall system are shown in Fig. 1.

The CRT Console refers to any suitable terminal having a keyboard for entry of the source code to be compiled and for entry of editing commands to change the code. The terminal also comprises a video display for implementation of a screen editor. The keyboard is preferably integral with the video display, forming a unitary console that has an RS-232C serial link to the remainder of the system.

This serial link is connected to the Input Port, which is preferably embodied as a UART (such as the 1602, AY-5-1013 or TMS 5501). Each keystroke on the keyboard of the CRT Console results in the serial transmission to the UART of a train of bits constituting the ASCII byte corresponding to the struck key.

The UART reforms the bits into that byte, which is transmitted in parallel on the data bus to the accumulator of the CPU. The UART also provides an output port.

Execution of an Out command by the CPU results in the transmission on the data bus of a byte from the accumulator to the UART, which then may serially transmit the byte to the CRT Console for display on the video screen.

In the usual operating mode of a conventional microcomputer system, the status of the input port is repeatedly tested by the CPU in a polling loop until the input port status indicates that a byte of data has been received and is available in the UART-received data register.

My invention instead employs an interrupt mode of operation, whereby the CPU normally executes the compiler until the UART receives a byte from the CRT Console.

The "data available" line of the UART is then activated; this in turn activates the Interrupt Controller to cause the CPU to execute the editor. Upon entry of the received character into the Source Buffer in main memory, or upon completion of an editing command, a Ret instruction is executed by the CPU to cause it to resume its execution of the Compiler from the point where it was interrupted.

As the Compiler is executed, it should perform lexical, syntactic and semantic analyses of the program source code stored in the Source Buffer. The Compiler also emits object code and stores it in the Object Buffer. Upon completion of entry and compilation of the source code program, control of the CPU may be passed to the Interpreter for execution of the object code if the latter is in the form of intermediate code.

The programmer may be given the option of saving the source code and/or object code in secondary storage, such as disk or tape media. Instead of generating intermediate code (p-code) for interpretation, the Compiler may be of the type that emits executable machine code.

The Compiler may require only a single pass through the source code, in the manner of the usual recursive-descent Pascal compiler. If the Compiler requires more than one pass, the first pass should perform the syntax analysis so as to reveal all syntax errors.

The interrupt facility enables the programmer to stop execution of the machine-code program at any time, examine the values of the variables and then continue execution. No additional hardware is required for this extra function, and the extra software is minimal.

Circuitry and Hardware

Fig. 2 refers to the circuitry and hardware components directly involved in the interrupt operation. Upon striking a key, a train of pulses constituting the byte corresponding to the struck key is emitted from the RS-232C serial port O.

A converter gate, C1, converts the pulse train from RS-232C levels to TTL (transistor-transistor-logic) levels to match the requirements of input port IN of the UART. The latter forms the serial pulse train into an eight-bit byte, which is stored in the received data register of the UART. The latter then outputs a data-available signal at pin DAV, whose signal is transmitted by gate G1 to a vectored interrupt input VI of the Priority Encoder.

Although only one input pin VI of the latter is shown, this chip has vectored interrupt input pins to which other interrupting devices may be connected.

The Priority Encoder arbitrates competing interrupt requests at its inputs and determines the request having the highest priority. Its enable input EI is grounded as shown (Fig. 2).

Assuming that the interrupt request from the Console and the UART win the priority contest, the Encoder then transmits a three-bit code, A0,A1,A2,

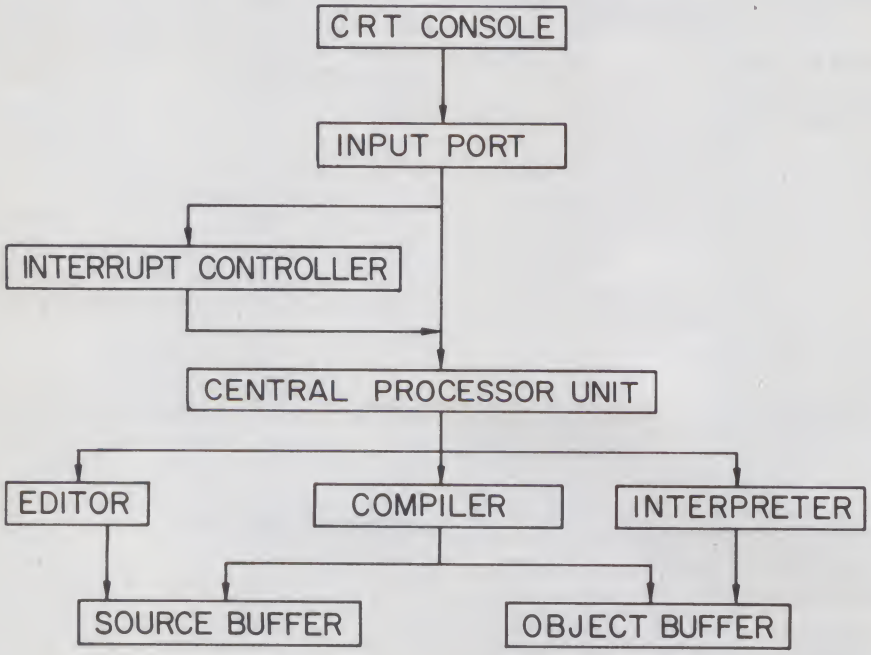


Fig. 1. Schematic diagram showing relation of the major hardware components constituting a preferred embodiment of the computer system in accordance with this invention.

to the respective inputs of the Interrupt Vector Register.

The other five inputs of the latter are held positive by potential source +V, so that the resulting byte input to this register chip constitutes an RST call instruction. The signal at output pin GS of the Priority Encoder is transmitted by gate G2 to the latch enable input LE of the Interrupt Vector Register. This causes the latter to latch the RST call instruction into its internal flip-flops.

Activation of output pin GS of the Priority Encoder also transmits an interrupt signal through AND gate A1 to the interrupt request pin INT* of the Z-80 CPU. Upon completion of the present instruction (and assuming that the interrupt of the processor is enabled), the CPU's status pins IORQ* and M1* are activated and their signals are transmitted by gates G3,G4 to AND gate A2 to form the INTA (interrupt acknowledge) signal. INTA is inverted by gate G5 and fed to the output enable pin OE of the Interrupt Vector Register, whereupon the RST call instruction at the inputs of the latter is jammed onto the data bus.

The RST instruction is then input to and executed by the Z-80, causing the CPU to push the contents of the program counter onto the stack, and further causing the CPU to jump to a predetermined location in low memory. This location stores a vector, or three-byte jump instruction, to an interrupt service routine.

The interrupt service routine includes the editor, as well as a subroutine, to store the contents of the CPU registers. Control of the CPU is then retained by the editor until either a character has been entered into the source code buffer or an editing operation has been completed.

The editor includes an input instruction that, when executed, causes the CPU to place the address of the UART's port on the Address Bus. This address is tested by the Comparator, and if it matches that of the port, the output pin EOut is activated to signal the Decoder.

The Decoder is controlled by other control and status signals (not shown) in the conventional manner so as to transmit a signal RDE* to the corresponding input RDE of the UART. The byte in the received data register (not shown) of the UART is then gated onto the data bus and transmitted to the accumulator within the CPU.

In the embodiment of the invention shown in Fig. 2, I chose to use the following integrated circuits:

UART:	1602
Priority Encoder:	74LS148
Interrupt Vector Register:	74LS373
Decoder:	74LS155
Comparator:	25LS2521
C1:	1489
C2:	1488

System Sequence

Fig. 3 shows the sequence of operation of the overall system. The Compiler normally has control of the CPU and either is in an infinite loop upon reaching a Pause Mark in the source code buffer or is in the process of analyzing the source code in the buffer.

The occurrence of a Keystroke at the terminal causes an Interrupt, whereupon the CPU is vectored to the interrupt service routine. The latter includes a subroutine to perform the Save Registers procedure shown in the drawing.

The Editor is then executed by the CPU. If the Keystroke corresponds to a control character, then an editing procedure, such as a cursor movement, screen scroll, character deletion or line deletion, is performed. If the Keystroke corresponds to an alphanumeric character or other valid source-code character, the latter is entered into the source code buffer and displayed on the video screen and the screen cursor is advanced to the next character position.

The interrupt service routine then jumps to its subroutine to perform the Restore Registers procedure, whereby the registers of the CPU are restored to their original values at the instant of the interrupt.

The Enable Interrupt instruction

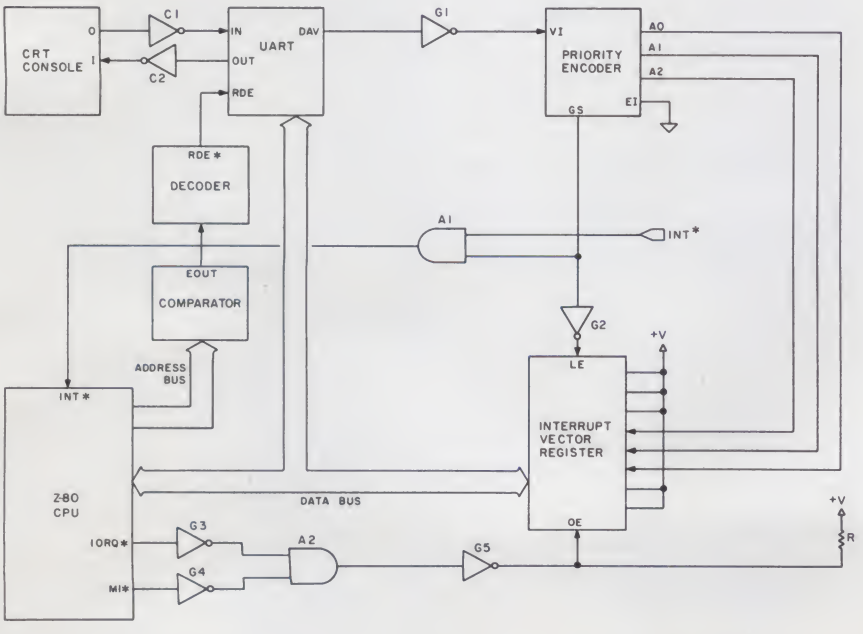


Fig. 2. Diagram showing interrupt logic and circuitry of the system hardware.

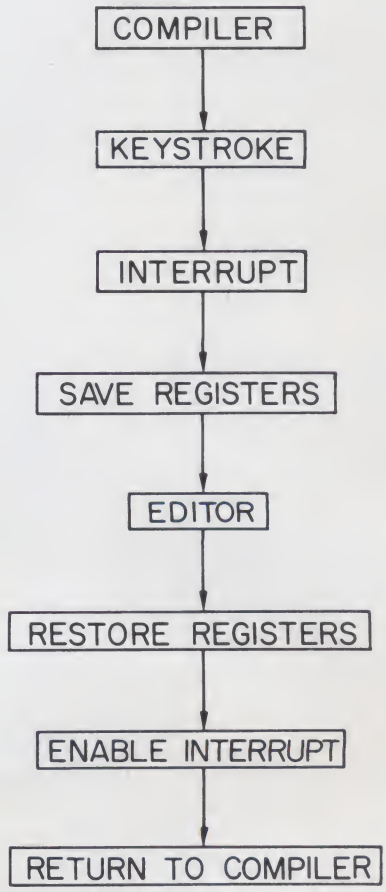


Fig. 3. Flowchart showing sequence of operations.

(EI) is then executed by the CPU so that the latter may respond to the next interrupt. Finally, the RET instruction is executed so that the CPU may return to the Compiler. The Compiler then resumes execution from the point where it was interrupted.

Fig. 4 shows the sequence of operations of the Compiler. After initialization, the Compiler performs its Read Character function whereby the byte in the first location of the source code buffer is read.

If this byte is the predetermined code designated as the Pause Mark, the Compiler pointer does not advance and the Compiler enters an infinite loop. It continues to read the same location until the content of this location is changed by the editor to a blank. When this change occurs, the Compiler memory pointer is incremented to the next location of the buffer so that the Compiler exits from its Pause loop, as indicated by the legend Advance Memory Pointer.

As indicated by Symbol?, the lexical analyzer of the Compiler then determines if the source character read-in constitutes the last character of a symbol, such as an identifier, operator or punctuation mark. If not, the Read Character function is executed again until a symbol is recognized.

The syntax analyzer of the Compiler then determines whether this symbol conforms to Correct Syntax in accordance with the grammar of the programming language. If not, an Error Message is displayed.

If the syntax is correct, the Read Character function is repeated until an error is found or until End Of Program is reached. In this event, the Code Generator may be invoked if this function is performed as a separate pass.

Alternatively, code generation may be performed concurrently with the lexical and syntactic analyses. The generated code then may be saved on disk and/or executed at the option of the programmer, as indicated by the legend Save/Execute Object Code.

For clarity in illustration, I'll show how the simple and widely published compiler PL/0 of Prof. N. Wirth ("Algorithms + Data Structures = Programs," Prentice-Hall, Inc., 1976, pp. 280–347) may be modified for implementation in the present invention. In the description below, the following identifiers have been added and do not appear in the original PL/0 compiler as published: CONT, PEEK, RECOMPILE, PTR, PM and SP.

The first statement in the modified compiler is:

```
IF NOT CONT THEN
```

The Boolean variable CONT is False upon initial entry into the compiler, signifying that this is not a continuation of a previous execution. That is, the compiler has just been entered for the first time during the present session.

The subsequent assignment statements therefore are executed to initialize the contents of the arrays WORD, WSYM, SSYM, MNEMONIC, DECLBEGSYS, STATBEGSYS and FACBEGSYS shown on pp. 346 and 347 of the Wirth treatise.

The values of these arrays remain fixed throughout execution of the compiler and the above conditional IF statement obviates the need to reexecute all of these assignment statements upon subsequent reinitializations of the compiler for recompilations. That is, after the first test of the variable CONT, it is set equal to True so as to bypass the assignment statements thereafter when recompilation is required.

After the conditional block of array assignments, a Peek assembly-language function is invoked to read the content of the memory location immediately preceding the start of the source code buffer (the location of the recompile flag). If this location contains the ASCII code for the letter R, then a compiler procedure Recompile is invoked to reinitialize the variables ERR, CC, CX and LL, and to assign the value of constant AL (10) to the variable KK.

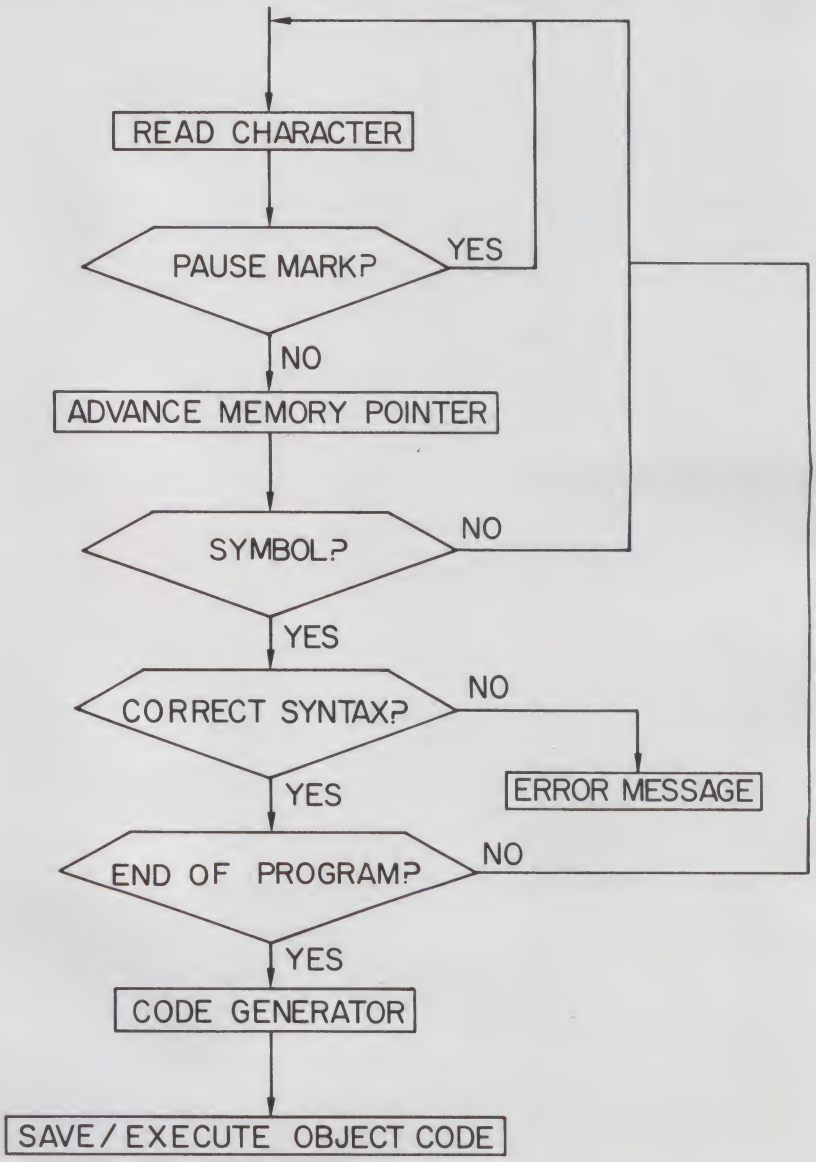
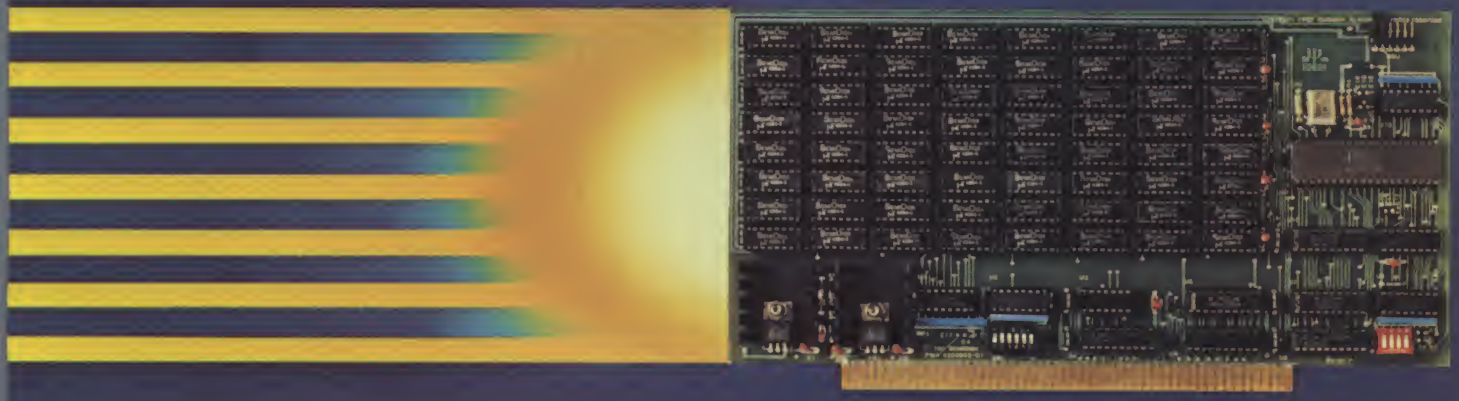


Fig. 4. Flowchart showing sequence of operations of the compiler.

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The RECOMPILE procedure also sets the value of a pointer variable PTR equal to the address of the beginning of the source code buffer. The pointer PTR is the memory pointer of the compiler's lexical analyzer, and it's successively advanced from byte to byte of the source code to read the latter. The lexical analyzer reads in the byte in the memory location pointed to by the pointer PTR.

The lexical analyzer embodies another major change in the PL/0 compiler. It is embodied in the procedure GETSYM, which also has nested therein the procedure GETCH.

GETSYM's first statement is:

```
WHILE CH = ' ' DO GETCH;
```

This constitutes part of an infinite loop that repeats for as long as GETCH returns the ASCII code (32) for a space. As explained below, the procedure GETCH will return the space code 32 whenever it reads the Pause Mark.

GETCH's first statement is:

```
CH := PTR^;
```

so as to read into the variable CH the contents of the source memory location pointed to by the pointer variable PTR. The next statement of GETCH is:

```
IF CH = CHR(PM) THEN
```

This statement tests the byte read for the Pause Mark (PM) value, a constant equal to 35. This value was chosen because it is a visible character and was otherwise unused.

Following the IF clause, the assignment is:

```
CH := CHR(SP)
```

The SP is equal to the ASCII code (32) for a space. Control then returns to GETSYM, where the condition of the WHILE clause is satisfied so that it again invokes GETCH. This sequence is repeated and results in an infinite loop for as long as the byte in the memory location being read is the Pause Mark.

After the editor changes that byte from the Pause Mark to the ASCII code for a space, the loop will be broken, because the Boolean condition of the IF clause no longer will be satisfied (variable CH won't equal PM). Instead, the following ELSE clause will be executed so as to advance the source memory pointer PTR to the next memory location by the statement:

```
PTR := PTR + 1 ;
```

The next invocation of GETCH will read the next source memory location to enable the compiler to continue its advance through the source code. The pointer PTR is repeatedly advanced, with each successive call of GETCH, until it reaches the new Pause Mark inserted by the editor, as described below.

Obtain the author's editor program by writing to Microcomputing, *80 Pine St., Peterborough, NH 03458.*

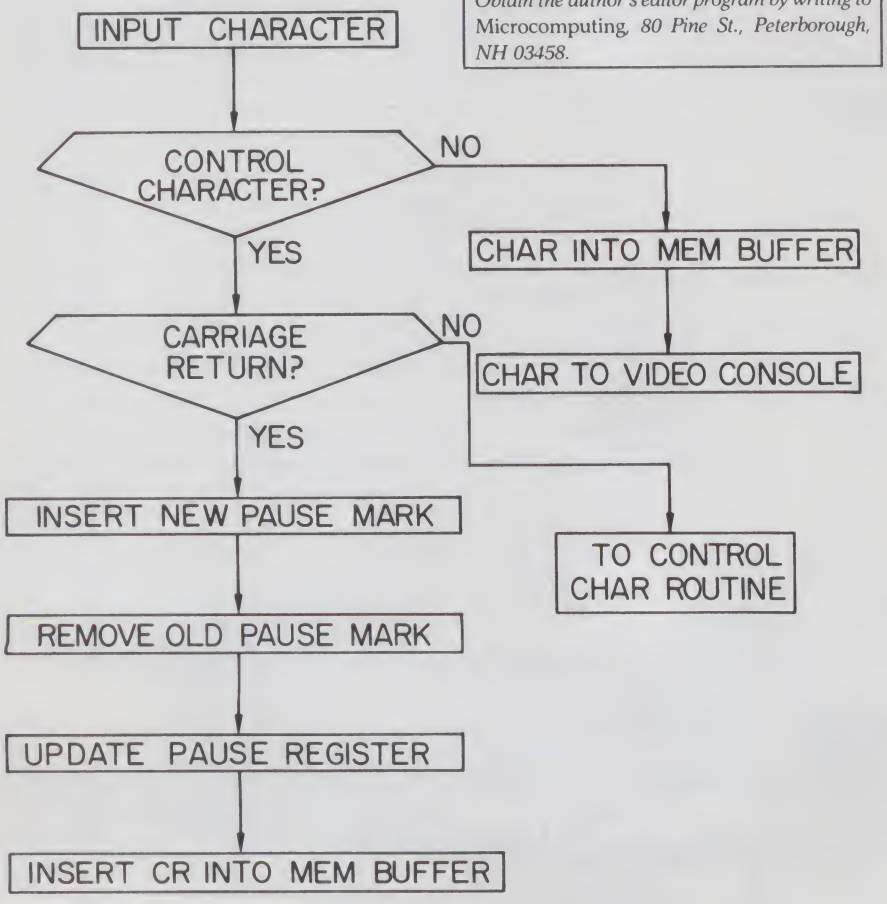


Fig. 5. Flowchart showing sequence of operations of the editor.

Editor's Sequence

Fig. 5 shows the sequence of operations of the editor. The Input Character function is performed in response to the Keystroke (Fig. 3). The editor then determines if the input byte is a Control Character. If not, the character is entered into the source code buffer as indicated at Char Into Mem Buffer. The input character is also displayed on the screen as indicated at Char to Video Console.

If the input character is a control character, the editor then determines if it is a Carriage Return?. If not, the appropriate one of the editor's routines for handling control characters is called, as indicated by the legend To Control Char Routine, and as described below with reference to Fig. 6.

Still referring to Fig. 5, if the input character is a carriage return, then a new Pause Mark is written into the source code buffer adjacent to the end of the current line, as indicated at Insert New Pause Mark. The old Pause Mark is changed to a blank space, as indicated by the legend Remove Old Pause Mark.

For convenience in finding the location of the Pause Mark, a memory word location is reserved as a Pause Register for storage of the location address of the Pause Mark. The Pause Mark's new address thus is stored in this memory register, as indicated by the legend Update Pause Register.

The ASCII code for a carriage return (13) is then entered into the source code buffer adjacent to the Pause Mark, as indicated by Insert CR Into Mem Buffer. The ASCII code for a line-feed (10) may be entered after the carriage return if this convention is desired.

Fig. 6 shows the sequence of operations of the editor routines for handling control characters input at the console. The input character first is tested to determine if it is the code for the Cursor Up operation. If not, it is tested to determine if it is the code for the Screen Up operation. If not, the input control character is handled in a conventional manner that will not be described further, as indicated by Process Other Control Char.

If the input control character is the code for the Cursor Up or Screen Up, then the respective operation Move Cursor Up or Scroll Screen is performed. In the former case, the cursor is moved up one line on the video screen. In the latter case, the screen is erased and is rewritten to display those lines of the source code buffer immediately preceding the erased lines.

As indicated at Insert New Pause Mark, a pause mark is put in adjacent to the end of the source code buffer line immediately preceding the line now bearing the new cursor position. The operations Remove Old Pause Mark and Update Pause Register are then performed in the same manner as described above, with respect to Fig. 5.

The operation Set Recompile Flag causes reinitialization of the compiler when the latter resumes control of the CPU after return from the interrupt service routine. This flag is preferably a memory location wherein a predetermined code may be stored to inform the compiler that recompilation of the source code is required.

In my version, this recompile flag is set to require recompilation whenever the cursor is moved up or the screen frame is scrolled up. That is, it is assumed that whenever the cursor is moved to point to source code that may have been compiled already, this code will be changed so as to require recompilation.

Another Way

An alternative method would be to set the recompile flag only if the previously compiled code is actually changed, since it is possible that the programmer may scroll up the screen and then scroll down again, without making any change in the source code.

Another alternative would be to maintain a memory register holding the address of the latest position of the compiler pointer. The editor then might compare this address with that of the source location pointed to by the cursor to determine if the editing changes are being made to already-compiled source code.

Although these alternative schemes result in fewer recompilations, my invention has the advantage of simpler implementation. Furthermore, the compilation process is so much faster than the manual typing of source code at the console that the compiler will recompile all but the largest programs and catch up with the programmer before he can type more than a few new lines of code. Therefore, the reduction of the number of recompilations to the absolute minimum is not essential.

The editor is written in Pascal with calls to 16 external assembly-language procedures and functions. The following is a description of those routines unique to this invention.

Upon entry to the editor, the Boolean variable ECont is tested to determine if this invocation of the editor is the first entry of the present session or if it's a continuation. If ECont is False, then it is set equal to True and the following procedures are called: INIT, NEWFILE, VECTOR and TOPL0.

INIT clears the source code buffer, sets the memory pointer to the start of the buffer, inserts Pause Mark at the first location of the buffer, sets the contents of Pause Register to the address of this first location, initializes the cursor to the first row and first column of the screen and sets the recompile flag pointer to the memory location preceding the first byte of the buffer.

NEWFILE prompts the programmer to select either a new file for entry of source code or an old file for editing. If the editing option is chosen, the file is read into the source code buffer from a disk and the first screen of source code is displayed.

The procedure Vector calls the external assembly procedure Poke three times to store in low memory (20H) the jump vector to subroutine SAVREGS, which stores the contents of the CPU registers. In response to an interrupt activated by a keystroke at the console, the CPU executes the RST4 call instruction and executes this jump vector and then the SAVREGS subroutine. After the registers are saved, a jump instruction in the subroutine sends the CPU to the editor.

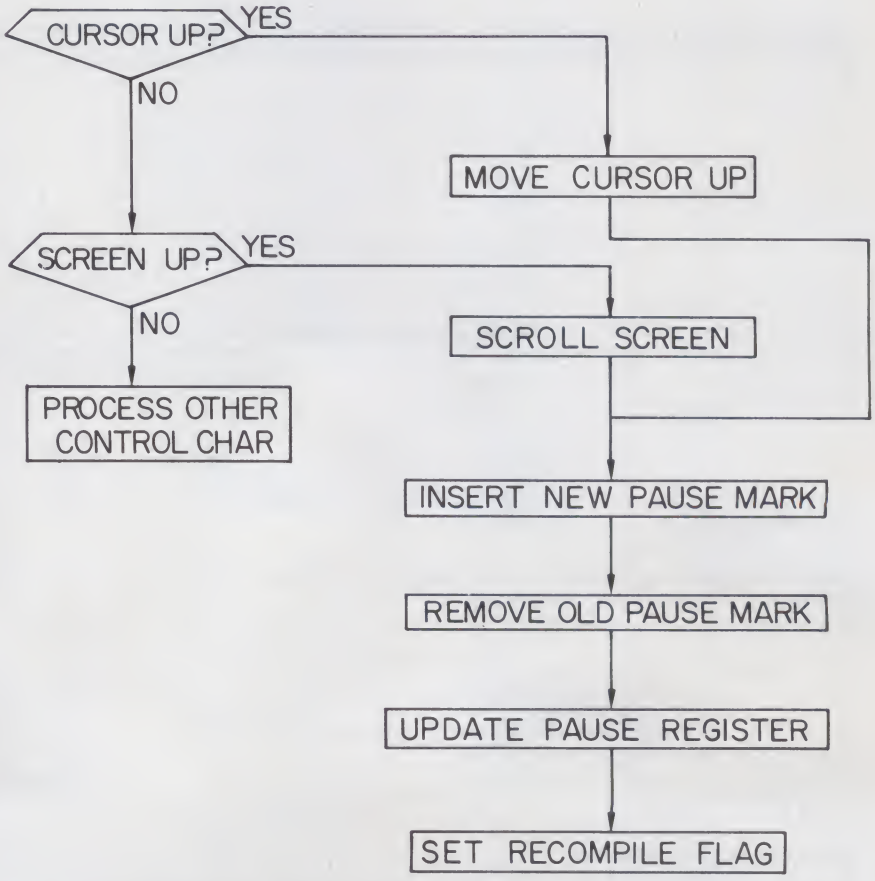


Fig. 6. Flowchart showing sequence of operations of control-character routines of the editor.

The TOPL0 procedure passes control to the PL/0 compiler. It usually is called after the editor has completed the character entry or editing function corresponding to the key struck at the terminal. In this case, the procedure is called after initialization of the editor.

Reading Into a Variable

The next statement of the editor is not reached until an interrupt occurs in response to a keystroke. This statement reads into a variable the ASCII code input from the UART's received data register. This input byte is tested to determine if it is a control character or alphanumeric character (greater than 31). An alphanumeric character would be entered into the source code buffer and displayed on the video screen in the conventional manner.

If the input byte is the control code for either moving the cursor down or scrolling the screen frame down, the appropriate procedure is called and concludes with an invocation of the procedure Update.

UPDATE enters into the source buffer a new Pause Mark, adjacent to the end of the old line in the case of a cursor down operation, and adjacent to the end of the invisible line preceding the first displayed line in the case of a scroll down operation. UPDATE also removes the old Pause Mark by substituting the ASCII code for a space (32) in place of the Pause Mark in its previous location. The Pause Register also is updated to the address of the new Pause Mark location.

If the input byte is the control code for either moving the cursor up or scrolling the screen frame up, the corresponding procedure performs the respective operation. This procedure concludes with invocations of UPDATE and RECOMPILE.

RECOMPILE stores the ASCII code for the letter R in the memory location immediately preceding the start of the source code buffer so as to constitute the recompile flag noted above. Upon completion of the cursor up operation or the screen scroll up operation, the CPU will return to the compiler, which will test the recompile flag, determine that the flag is set and then call its reinitialization procedure to force the compiler to recompile the source code from the beginning of the source buffer.

If the input byte is the ASCII code for a carriage return (13), the procedure CRET is called. This routine enters into the source buffer a new Pause Mark adjacent to the carriage return code, removes the old Pause Mark and updates the Pause Register, among other more conventional functions (such as adding a line-feed code to the buffer, updating the cursor and scrolling the video display if the present line is the last line of the screen).

One of Many Forms

It should be understood that the preferred embodiment described above and shown in the drawings is illustrative of merely one of the many forms that the invention may take in practice. Numerous modifications thereof can be made without departing from the scope of this invention.

For example, instead of the Pause Mark implemented as a predetermined code entered into a memory location within the source code buffer, the pause location may be defined for the compiler by a memory address stored in a register. The compiler then may be prevented from analyzing code stored in memory locations beyond

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11306	22	1.12	1.02	.85
11307	24	1.25	1.14	.95
11308	28	1.52	1.38	1.15
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11204	18	.18	.17	.15
11205	20	.20	.18	.16
11206	22	.22	.20	.18
11207	24	.24	.22	.20
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11209	40	.40	.37	.33

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13829	CB3804	3.0-7.0	26±0.7	0-10	.48x.51x3.05	7.95
13830	CB3814	3.0-7.0	-26±0.7	0-10	.48x.51x3.05	7.95
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13804	SOLV15-15	15	1.2A	4-7/18x4x2	Fixed included	39.95
13808	SOLV15-24	24	0.75A	4-7/18x4x2	Fixed included	39.95
13806	SOLV30-5	5	6.0A	5-5/8x4-7/8x3-3/18	OVP-4	59.95
13809	SOLV30-12	12	4.0A	5-5/8x4-7/8x3-3/18	OVP-4	59.95
13810	SOLV30-15	15	3.3A	5-5/8x4-7/8x3-3/18	OVP-4	59.95
13812	SOLV30-24	24	2.0A	5-5/8x4-7/8x3-3/18	OVP-4	59.95
13802-1	Data Sheet for SOLV Series					.25

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this address, which may be incremented and decremented by the editor.

The interrupt that causes control of the CPU to pass from the compiler to the editor may be activated by a timer or clock instead of by the keyboard. That is, the compiler may be periodically interrupted and the input port polled to test if a key has been struck. If not, the interrupt is terminated and control returns to the compiler.

If polling the port reveals that a key has been struck, then the interrupt service routine editor takes control and is executed in the manner described above for the disclosed preferred embodiment. For most applications, clock interrupts at intervals of about every ten to 30 milliseconds should be frequent enough to keep up with keys stroked at the keyboard.

The recompile flag may be set whenever the compiler determines that the source code contains an error. That is, it may be assumed that whenever an error is revealed, the source code will be changed so as to require recompilation.

Another possible modification is to eliminate recompilation from the beginning of the source code in instances where the error occurs in the last completed line.

During the compilation of that line, the resulting register values, table entries, stack manipulations, variable assignments and code buffer entries are temporarily stored and are not entered until the syntax analysis of the source line is completed and determines that the line conforms to the grammar.

If the line contains an error, these temporary entries are discarded and the compiler pointer is moved back to the end of the previous line, thereby obviating recompilation. However, this scheme still will require recompilation if source lines previous to the last line are modified.

Still another possibility would be to have the editor advance Pause Mark after entry of each character or after entry of each delimited symbol.

This would provide the advantage of revealing an error almost instantly upon its entry to the keyboard, instead of waiting until completion of the current line. The disadvantage would be that recompilation would be required for every minor typing error without giving the programmer a chance to correct it before it is scanned and parsed.■

Program Listing. N. Wirth's PL/0 compiler as modified by author.

```
                (*  LAST CHANGE AUG. 15, 1982  *)
PROGRAM PL0;
(*$S++)
(*$Z $D000*)
                (* PL/0 COMPILER WITH  CODE GENERATION *)

    CONST
        CR = 13;        (* CARRIAGE RETURN *)
        LF = 10;        (* LINE FEED *)
        PM = 35;        (* PAUSE MARK *)
        SP = 32;        (* SPACE *)
        BUF = $9000;    (* START (STX) SOURCE BUFFER *)
        ENF = 26;       (* END FILE *)
        NORW = 11;      (* NO. OF RESERVED WORDS *)
        TXMAX = 100;    (* LINGTH OF IDENTIFIER TABLE *)
        NMAX = 14;      (* MAX. NO. OF DIGITS IN NUMBERS *)
        AL = 10;        (* LENGTH OF IDENTIFIERS *)
        AMAX = 2047;    (* MAXIMUM ADDRESS *)
        LEVMAX = 3;     (* MAXIMUM DEPTH OF BLOCK NESTING *)
        CXMAX = 200;    (* SIZE OF CODE ARRAY *)
    TYPE
        SYMBOL =
        (NUL, IDENT, NUMBER, PLUS, MINUS, TIMES, SLASH, ODDSYM,
        EQL, NEQ, LSS, LEQ, GTR, GEQ, LPAREN, RPAREN, COMMA, SEMICOLON,
        PERIOD, BECOMES, BEGINSYM, ENDSYM, IFSYM, THENSYM,
        WHILESYM, DOSYM, CALLSYM, CONSTSYM, VARSYM, PROCSYM);

        ALFA = PACKED ARRAY[1..AL] OF CHAR;
        OBJECT = (CONSTANT,  VARIABLE, PROCEDUR);
        SYMSET = SET OF SYMBOL;
        FCT  =  (LIT, OPR, LOD, STO, CAL, INT, JMP, JPC);  (* FUNCTIONS
        INSTRUCTION = PACKED RECORD
                        F: FCT;         (* FUNCTION CODE *)
                        L: 0..LEVMAX;   (* LEVEL *)
                        A: 0..AMAX;     (* DISPLACEMENT ADDRESS *)

                      END;

(*      LIT  0,A    : LOAD CONSTANT A
        OPR  0,A    : EXECUTE OPERATION A
        LOD  L,A    : LOAD VARIABLE L,A
        STO  L,A    : STORE VARIABLE L,A
        CAL  L,A    : CALL PROCEDURE A AT LEVEL L
        INT  0,A    : INCREMENT T-REGISTER BY A
        JMP  0,A    : JUMP TO A
        JPC  0A     : JUMP CONDITIONAL TO A         *)

    VAR
        C:      CHAR;
        PTR:    ^CHAR;          (* POINTER TO SOURCE BUFFER *)
        RFLAG:  ^CHAR;          (* RECOMPILE FLAG *)
        CONT:   BOOLEAN;        (* FLAG FOR INITIALIZATION *)
        CH:     CHAR;           (* LAST CHARACTER READ *)
        SYM:    SYMBOL;         (* LAST SYMBOL READ *)
        ID:     ALFA;           (* LAST IDENTIFIER READ *)
        NUM:    INTEGER;        (* LAST NUMBER READ *)
        CC:     INTEGER;        (* CHAHACTER COUNT *)
        LL:     INTEGER;        (* LINE LENGTH *)
        KK:     INTEGER;
        ERR:    INTEGER;
        CX:     INTEGER;        (* CODE ALLOCATION INDEX *)
        LINE:   ARRAY[1..81] OF CHAR;
        A:      ALFA;
        CODE:   ARRAY[0..CXMAX] OF INSTRUCTION;
        WSYM:   ARRAY[1..NORW] OF SYMBOL;
        WORD:   ARRAY[1..NORW] OF ALFA;
        SSYM:   ARRAY[CHAR] OF SYMBOL;
        MNEMONIC:  ARRAY[FCT] OF
                PACKED ARRAY[1..5] OF CHAR;
        DECLBEGSYS, STATBEGSYS, FACBEGSYS: SYMSET;
        TABLE:  ARRAY[0..TXMAX] OF
                    RECORD
                        NAME: ALFA;
                        CASE KIND: OBJECT OF
                            CONSTANT: (VAL: INTEGER);
                            VARIABLE, PROCEDUR: (LEVEL,ADR: INTEGER)
                    END;

    EXTERNAL FUNCTION PEEK(LOC : INTEGER) : CHAR;
    EXTERNAL PROCEDUE ABORT;

    PROCEDURE ERROR(N:INTEGER);
        BEGIN
            WRITELN(' ****',' ': CC-1, '^', N:2);
            ERR := ERR + 1
        END (* ERROR *);

    PROCEDURE GETSYM;
        VAR
            I, J, K:INTEGER;

        PROCEDURE GETCH;
            BEGIN
              CH := PTR^;
              IF CH = CHR(PM) THEN
                CH := CHR(SP)
              ELSE
                BEGIN
                  PTR := PTR + 1;
                        IF CH = CHR(ENF) THEN
                            BEGIN
                                WRITE('PROGRAM INCOMPLETE');
                                CC := 0;
                                WRITE(CX:5, ' ')
                            END;
                  IF (CH = CHR(CR)) OR (CH = CHR(LF)) THEN
                  CH := CHR(SP)
                END (* ELSE *)
              END (* GETCH *) ;

            BEGIN  (* GETSYM *)
                WHILE CH = ' ' DO GETCH;
                IF CH IN ['A'..'Z'] THEN
                    BEGIN (* IDENTIFIER OR RESERVED WORD *)
                        K := 0;
                        REPEAT
                            IF K < AL THEN
                                BEGIN
                                    K := K+1;
                                    A[K] := CH
                                END ;
                            GETCH
                        UNTIL NOT (CH IN ['A'..'Z','0'..'9']);
                        IF K >= KK THEN
                            KK := K
                        ELSE
                            REPEAT
                                A[KK] := ' ';
                                KK:= KK-1
                            UNTIL KK = K;
                        ID := A;
                        I := 1;
                        J := NORW;
                        REPEAT
                            K := (I+J) DIV 2;
                            IF ID <= WORD[K] THEN J := K-1;
                            IF ID >= WORD[K] THEN I := K+1
                        UNTIL I > J;
                        IF I > J+1 THEN
                            SYM := WSYM[K]
                        ELSE
                            SYM := IDENT
                    END
                ELSE
                    IF CH IN ['0'..'9'] THEN
                        BEGIN (* NUMBER *)
                            K := 0;
                            NUM := 0;
                            SYM := NUMBER;
                            REPEAT
                                NUM := 10*NUM + (ORD(CH)-ORD('0'));
                                K := K+1;
                                GETCH
                            UNTIL NOT (CH IN ['0'..'9']);
                            IF K > NMAX THEN ERROR (30)
                        END
                    ELSE
                        IF CH = ':' THEN
                            BEGIN
                                GETCH;
                                IF CH = '=' THEN
                                    BEGIN
                                        SYM := BECOMES;
                                        GETCH
                                    END
                                ELSE
                                    SYM := NUL;
                            END
                        ELSE
                            BEGIN
```

More →

Listing continued.

```
                        SYM := SSYM[CH];
                        GETCH
                    END
                END (* GETSYM *) ;

PROCEDURE GEN(X: FCT; Y,Z: INTEGER);
    BEGIN
        IF CX > CXMAX THEN
            BEGIN
                WRITE('PROGRAM TOO LONG');
                ABORT
            END ;
        WITH CODE[CX] DO
            BEGIN
                F:= X;
                L := Y;
                A := Z
            END
    END; (* GEN *)

PROCEDURE TEST(S1,S2: SYMSET; N: INTEGER);
    BEGIN
        IF NOT (SYM IN S1) THEN
            BEGIN
                ERROR(N);
                S1 := S1 + S2;
                WHILE NOT(SYM IN S1) DO GETSYM
            END
    END(* TEST *) ;

PROCEDURE BLOCK(LEV,TX: INTEGER; FSYS: SYMSET);
    VAR DX: INTEGER;    (* DATA ALLOCATION INDEX *)
        TX0: INTEGER;   (* INITIAL TABLE INDEX *)
        CX0: INTEGER;   (* INITIAL CODE INDEX *)

    PROCEDURE ENTER(K: OBJECT);
        BEGIN(* ENTER OBJECT INTO TABLE *)
            TX := TX + 1;
            WITH TABLE[TX]DO
                BEGIN
                    NAME := ID;
                    KIND := K;
                    CASE K OF
                        CONSTANT: BEGIN
                                      IF NUM > AMAX THEN
                                          BEGIN
                                              ERROR (30);
                                              NUM := 0
                                          END;
                                      VAL := NUM
                                  END ;
                        VARIABLE: BEGIN
                                      LEVEL := LEV;
                                      ADR := DX;
                                      DX := DX+1;
                                  END ;
                        PROCEDUR: LEVEL := LEV
                    END
                END
            END(* ENTER *);

    FUNCTION POSITION(ID: ALFA): INTEGER;
        VAR I: INTEGER;
        BEGIN (* FIND IDENTIFIER ID IN TABLE *)
            TABLE[0].NAME := ID;
            I := TX;
            WHILE TABLE[I].NAME <> ID DO I := I-1;
            POSITION := I
        END (* POSITION *) ;

    PROCEDURE CONSTDECLARATION;
        BEGIN
            IF SYM = IDENT THEN
                BEGIN
                    GETSYM;
                    IF SYM IN [EQL ,BECOMES] THEN
                        BEGIN
                            IF SYM = BECOMES THEN ERROR (1);
                            GETSYM;
                            IF SYM = NUMBER THEN
                                BEGIN
                                    ENTER(CONSTANT);
                                    GETSYM
                                END
                            ELSE
                                ERROR (2)

                        END
                    ELSE
                        ERROR (3)
                END
            ELSE
                ERROR (4)
        END (* CONSTDECLARATION *) ;

    PROCEDURE VARDECLARATION;
        BEGIN
            IF SYM = IDENT THEN
                BEGIN
                    ENTER(VARIABLE);
                    GETSYM
                END
            ELSE
                ERROR (4)
        END (* VARDECLARATION *) ;

    PROCEDURE LISTCODE;
        VAR I: INTEGER;
            BEGIN (* LIST CODE GENERATED FOR THIS BLOCK *)
                FOR I := CX0 TO CX-1 DO
                    WITH CODE[I] DO
                        WRITELN(I, MNEMONIC[F]:5, L:3, A:5)
            END(* LISTCODE *) ;

    PROCEDURE STATEMENT(FSYS: SYMSET);
        VAR I,CX1,CX2: INTEGER;

        PROCEDURE EXPRESSION(FSYS: SYMSET);
            VAR ADDOP: SYMBOL;

            PROCEDURE TERM(FSYS: SYMSET);
                VAR MULOP: SYMBOL;

                PROCEDURE FACTOR(FSYS: SYMSET);
                    VAR I: INTEGER;
                    BEGIN
                        TEST(FACBEGSYS,FSYS, 24);
                        WHILE SYM IN FACBEGSYS DO
                            BEGIN
                                IF SYM = IDENT THEN
                                    BEGIN
                                        I := POSITION(ID);
                                        IF I = 0 THEN
                                            ERROR(11)
                                        ELSE
                                            WITH TABLE[I] DO
                                                CASE KIND OF
                                                    CONSTANT: GEN(LIT, 0, VAL)
                                                    VARIABLE: GEN(LOD,
                                                                  LEV-LEVEL, ADR);
                                                PROCEDUR: ERROR(21)
                                            END ;
                                            GETSYM
                                    END
                                ELSE
                                    IF SYM = NUMBER THEN
                                        BEGIN
                                            IF NUM > AMAX THEN
                                                BEGIN
                                                    ERROR(30);
                                                    NUM :=0
                                                END ;
                                            GEN(LIT, 0, NUM); GETSYM
                                        END
                                ELSE
                                    IF SYM = LPAREN THEN
                                        BEGIN
                                            GETSYM;
                                            EXPRESSION([RPAREN]+FSYS);
                                            IF SYM = RPAREN THEN GETSYM
                                            ELSE ERROR(22)
                                        END ;
                                TEST(FSYS,[LPAREN],23)
                            END
                    END (* FACTOR *) ;

                BEGIN (* TERM *)
                  FACTOR(FSYS+[TIMES, SLASH]);
                  WHILE SYM IN [TIMES, SLASH] DO
                    BEGIN
                      MULOP := SYM;
                      GETSYM;
                      FACTOR(FSYS+[TIMES, SLASH]);
                      IF MULOP = TIMES THEN
                        GEN (OPR,0,4)
                      ELSE
                        GEN(OPR,0,5)
                    END
                END (* TERM *) ;

                BEGIN (* EXPRESSION *)
                  IF SYM IN [PLUS, MINUS] THEN
                    BEGIN
                      ADDOP := SYM;
                      GETSYM;
                      TERM(FSYS+[PLUS, MINUS]);
                      IF ADDOP = MINUS THEN GEN(OPR,0,1)
                    END
                  ELSE
                    TERM(FSYS+[PLUS, MINUS]);
                  WHILE SYM IN [PLUS, MINUS] DO
                    BEGIN
                      ADDOP := SYM;
                      GETSYM;
                      TERM(FSYS+[PLUS, MINUS]);
                      IF ADDOP = PLUS THEN GEN(OPR,0,2) ELSE GEN(OPR,0,3)
                    END
                END (* EXPRESSION *) ;

            PROCEDURE CONDITION(FSYS: SYMSET);
              VAR RELOP: SYMBOL;
            BEGIN
              IF SYM = ODDSYM THEN
                BEGIN
                  GETSYM;
                  EXPRESSION(FSYS);
                  GEN(OPR,0,6)
                END
              ELSE
                BEGIN
                  EXPRESSION([EQL, NEQ, LSS, GTR, LEQ, GEQ]+FSYS);
                  IF NOT(SYM IN [EQL, NEQ, LSS, LEQ, GTR, GEQ]) THEN
                    ERROR (2)
                  ELSE
                    BEGIN
                      RELOP := SYM;
                      GETSYM;
                      EXPRESSION(FSYS);
                      CASE RELOP OF
                            EQL: GEN(OPR,0, 8);
                            NEQ: GEN(OPR,0, 9);
                            LSS: GEN(OPR,0,10);
                            GEQ: GEN(OPR,0,11);
                            GTR: GEN(OPR,0,12);
                            LEQ: GEN(OPR,0,13);
                      END  (* CASE *)
                    END  (* ELSE *)
                END  (* ELSE *)
            END (* CONDITION *) ;

            BEGIN (* STATEMENT *)
              IF SYM = IDENT THEN
                BEGIN
                  I := POSITION(ID);
                  IF I = 0 THEN
                    ERROR (11)
                  ELSE
                    IF TABLE[I].KIND <> VARIABLE THEN
                      BEGIN (* ASSIGNMENT TO NON-VARIABLE *)
                        ERROR (12);
                        I :=0
                      END ;
                  GETSYM;
                  IF SYM = BECOMES THEN
                    GETSYM
                  ELSE
                    ERROR (13);
                  EXPRESSION(FSYS);
                  IF I <> 0 THEN
                    WITH TABLE[I] DO
                      GEN(STO, LEV-LEVEL, ADR)
                  END

                ELSE IF SYM = CALLSYM THEN
                  BEGIN
                    GETSYM;
                    IF SYM <> IDENT THEN
                      ERROR (14)
                    ELSE
                      BEGIN
                        I := POSITION(ID);
                        IF I = 0 THEN
                          ERROR (11)
                        ELSE
                          WITH TABLE[I] DO
                            IF KIND = PROCEDUR THEN
                              GEN (CAL, LEV-LEVEL, ADR)
                            ELSE
                              ERROR (15);
                        GETSYM
                      END  (* ELSE *)
                    END  (* ELSE IF *)

                  ELSE IF SYM = IFSYM THEN
                    BEGIN
                      GETSYM;
                      CONDITION([THENSYM, DOSYM]+FSYS);
                      IF SYM = THENSYM THEN
```

More →

Listing continued.

```
                GETSYM
              ELSE
                ERROR(16);
              CX1 := CX;
              GEN(JPC,0,0);
              STATEMENT(FSYS);
              CODE[CX1].A := CX
            END  (* ELSE IF *)

          ELSE IF SYM = BEGINSYM THEN
            BEGIN
              GETSYM;
              STATEMENT([SEMICOLON, ENDSYM]+FSYS);
              WHILE SYM IN [SEMICOLON]+STATBEGSYS DO
                BEGIN
                  IF SYM = SEMICOLON THEN
                    GETSYM
                  ELSE
                    ERROR (10);
                  STATEMENT([SEMICOLON, ENDSYM]+FSYS)
                END ;
              IF SYM = ENDSYM THEN
                GETSYM
              ELSE
                ERROR (17)
            END  (* ELSE IF *)

          ELSE IF SYM = WHILESYM THEN
            BEGIN
              CX1 := CX;
              GETSYM; CONDITION([DOSYM]+FSYS);
              CX2 := CX;
              GEN(JPC,0,0);
              IF SYM = DOSYM THEN
                GETSYM
              ELSE
                ERROR (18);
              STATEMENT(FSYS);
              GEN(JMP,0,CX1);
              CODE[CX2].A := CX
            END ;  (* ELSE IF *)

          TEST(FSYS, [ ], 19)
      END (* STATEMENT *) ;


      BEGIN (* BLOCK *)
      DX := 3;
      TX0 := TX;
      TABLE[TX].ADR := CX;
      GEN(JMP,0,0);
      IF LEV > LEVMAX THEN ERROR (32);
      REPEAT
          IF SYM = CONSTSYM THEN
              BEGIN
                  GETSYM;
                  REPEAT
                      CONSTDECLARATION;
                      WHILE SYM = COMMA DO
                          BEGIN
                              GETSYM;
                              CONSTDECLARATION
                          END ;
                      IF SYM = SEMICOLON THEN GETSYM ELSE ERROR (5)
                  UNTIL SYM <> IDENT;
              END ;

          IF SYM = VARSYM THEN
            BEGIN
              GETSYM;
              REPEAT
                VARDECLARATION;
                WHILE SYM = COMMA DO
                  BEGIN
                    GETSYM;
                    VARDECLARATION
                  END;
                IF SYM = SEMICOLON THEN
                  GETSYM
                ELSE
                  ERROR(5)
              UNTIL SYM <> IDENT;
          END;  (* IF VARSYM *)

            WHILE SYM = PROCSYM DO
              BEGIN
                  GETSYM;
                  IF SYM = IDENT THEN
                      BEGIN
                          ENTER(PROCEDUR);
                          GETSYM
                      END
                  ELSE ERROR (4);
                  IF SYM = SEMICOLON THEN GETSYM ELSE ERROR (5);
                  BLOCK(LEV+1,TX,[SEMICOLON]+FSYS);
                  IF SYM = SEMICOLON THEN
                      BEGIN
                          GETSYM;
                          TEST(STATBEGSYS+[IDENT, PROCSYM],FSYS, 6)
                      END
                  ELSE ERROR (5)
              END ;
          TEST(STATBEGSYS+[IDENT],DECLBEGSYS,7)
      UNTIL NOT(SYM IN DECLBEGSYS);
      CODE[TABLE[TX0].ADR].A :=CX;
      WITH TABLE[TX0] DO
          BEGIN
              ADR := CX; (* START ADR OF CODE *)
          END ;
      CX0 := CX; GEN(INT,0,DX);
      STATEMENT([SEMICOLON,ENDSYM]+FSYS);
      GEN(OPR,0,0); (* RETURN *)
      TEST(FSYS, [ ], 8);
      LISTCODE;
  END (* BLOCK *) ;


  PROCEDURE INTERPRET;
      CONST STACKSIZE = 500;
      VAR P,B,T: INTEGER; (* PROGRAM-,BASE-,TOPSTACK-REGISTERS *)
          I: INSTRUCTION; (* INSTRUCTION REGISTER *)
          S: ARRAY [1..STACKSIZE] OF INTEGER; (* DATASTORE *)

      FUNCTION BASE(L: INTEGER): INTEGER;
          VAR B1: INTEGER;
          BEGIN
              B1 := B; (* FIND BASE L LEVELS DOWN *)
              WHILE L > 0 DO
                  BEGIN
                      B1 := S[B1];
                      L := L-1
                  END ;
              BASE := B1
          END (* BASE *) ;
```

```
BEGIN
    WRITELN('START PL/0');
    T := 0;
    B := 1;
    P := 0;
    S[1] := 0; S[2] := 0; S[3] := 0;
    REPEAT
        I := CODE[P];
        P := P+1;
        WITH I DO
            CASE F OF
                LIT: BEGIN T := T+1; S[T] := A
                     END ;
                OPR: CASE A OF    (* OPERATOR *)
                     0: BEGIN (* RETURN *) T := B-1; P := S[T+3]; B := S[T
                        END ;
                     1: S[T] := -S[T];
                     2: BEGIN T := T-1; S[T] := S[T] + S[T+1]
                        END ;
                     3: BEGIN T := T-1; S[T] := S[T] - S[T+1] END ;
                     4: BEGIN T := T-1; S[T] := S[T] * S[T+1]
                        END ;
                     5: BEGIN T := T-1; S[T] := S[T] DIV S[T+1]
                        END ;
                     6: S[T] := ORD(ODD(S[T]));
                     8: BEGIN T := T-1; S[T] := ORD(S[T]=S[T+1])
                        END ;
                     9: BEGIN T := T-1; S[T] := ORD(S[T]<>S[T+1])
                        END ;
                    10: BEGIN T := T-1; S[T] := ORD(S[T]<S[T+1])
                        END ;
                    11: BEGIN T := T-1; S[T] := ORD(S[T]>=S[T+1])
                        END ;
                    12: BEGIN T := T-1; S[T] := ORD(S[T]>S[T+1])
                        END ;
                    13: BEGIN T := T-1; S[T] := ORD(S[T]<=S[T+1])
                        END ;
                    END ;
                LOD: BEGIN T := T+1; S[T] := S[BASE(L)+A]
                     END ;
                STO: BEGIN S[BASE(L)+A] := S[T]; WRITELN(S[T]); T := T-1
                     END ;
                CAL: BEGIN (* GENERATE NEW BLOCK MARK *)
                         S[T+1] := BASE(L); S[T+2] := B; S[T+3] := P;
                         B := T+1; P := A
                     END ;
                INT: T := T+A;
                JMP: P := A;
                JPC: BEGIN IF S[T] = 0 THEN P := A; T := T-1
                     END
                END (* WITH, CASE *)
        UNTIL P = 0;
        WRITE('END PL/0');
    END (* INTERPRET *) ;


PROCEDURE ZERO;
  BEGIN

      ERR := 0;
      CC := 0;
      CX := 0;
      LL := 0;
      CH := ' ';
      KK := AL;

  END;


  PROCEDURE RECOMPILE;
          BEGIN
            RFLAG := BUF - 1;
            RFLAG^ := ' ';
            PTR := BUF + 1;
            ZERO;
          END;  (* RECOMPILE *)


    BEGIN (* MAIN PROGRAM *)
     IF NOT CONT THEN
       BEGIN
              CONT := TRUE;
              RFLAG := BUF - 1;
              RECOMPILE;
              FOR CH := 'A' TO ';' DO SSYM[CH] := NUL;
              WORD[ 1] := 'BEGIN     ';   WORD[ 2] := 'CALL      ';
              WORD[ 3] := 'CONST     ';   WORD[ 4] := 'DO        ';
              WORD[ 5] := 'END       ';   WORD[ 6] := 'IF        ';
              WORD[ 7] := 'ODD       ';   WORD[ 8] := 'PROCEDUR  ';
              WORD[ 9] := 'THEN      ';   WORD[10] := 'VAR       ';
              WORD[11] := 'WHILE     ';
              WSYM[ 1] := BEGINSYM; WSYM[ 2] := CALLSYM;
              WSYM[ 3] := CONSTSYM; WSYM[ 4] := DOSYM;
              WSYM[ 5] := ENDSYM;   WSYM[ 6] := IFSYM;
              WSYM[ 7] := ODDSYM;   WSYM[ 8] := PROCSYM;
              WSYM[ 9] := THENSYM;  WSYM[10] := VARSYM;
              WSYM[11] := WHILESYM;
              SSYM['+'] := PLUS;    SSYM['-'] := MINUS;
              SSYM['*'] := TIMES;   SSYM['/'] := SLASH;
              SSYM['('] := LPAREN;  SSYM[')'] := RPAREN;
              SSYM['='] := EQL;     SSYM[','] := COMMA;
              SSYM['.'] := PERIOD;  SSYM['#'] := NEQ;
              SSYM['<'] := LSS;     SSYM['>'] := GTR;
              SSYM[';'] := SEMICOLON;
              MNEMONIC[LIT]  := 'LIT  '; MNEMONIC[OPR] := 'OPR  ';
              MNEMONIC[LOD]  := 'LOD  '; MNEMONIC[STO] := 'STO  ';
              MNEMONIC[CAL]  := 'CAL  '; MNEMONIC[INT] := 'INT  ';
              MNEMONIC[JMP]  := 'JMP  '; MNEMONIC[JPC] := 'JPC  ';
              DECLBEGSYS := [CONSTSYM, VARSYM, PROCSYM];
              STATBEGSYS := [BEGINSYM, CALLSYM, IFSYM, WHILESYM];
              FACBEGSYS  := [IDENT, NUMBER, LPAREN];
       END;  (* IF NOT CONT *)



       C := PEEK(BUF - 1);
       IF C = 'R' THEN
         RECOMPILE;
       CH := ' ';
       GETSYM;
       BLOCK(0,0,[PERIOD]+DECLBEGSYS+STATBEGSYS);
       IF SYM <> PERIOD THEN ERROR (9);
       IF ERR = 0 THEN INTERPRET ELSE WRITE('ERRORS IN PL/0 PROGRAM');
       WRITELN
  END .
```

Sony's Marketable Micro

With its many unique features, including micro floppies and an assortment of available add-ons, the SMC-70 is the "one and only" micro from Sony.

By Bruce Kline



The Sony SMC-70 microcomputer, featuring 3½-inch micro floppy disk drives.

The Japanese microcomputer industry appears to be waiting on technology's sideline. A few companies, though, are actively pushing products: Sharp, Panasonic, NEC, Epson and Toshiba. And now Sony is joining that list—with a system that could only be the product of long-term development: the Sony SMC-70 (Sony Microcomputer Products, Sony Drive, Park Ridge, NJ 07656).

Sony is selling a "system," not just an eight-bit microcomputer. The minimum system could be as small as the SMC-70 computer/keyboard with a monochrome monitor and a cassette recorder; however, Sony is promoting the SMC-70 as a business machine that includes the SMC-70 with dual disks, a color monitor and a printer. Available expansions include a numeric keypad, up to four micro floppy disk drives, an eight-inch floppy controller and a video signal converter for connection to a TV. Other peripherals that are or will be available from Sony include a light pen, a cache disk unit, a second RS-232C interface, an IEEE-488 interface, a battery back-up unit, a bus expansion unit, an 8086 adapter, a 192K bank RAM for the Z-80 and up to 768K of RAM for the 8086.

The packaging is compact and well-

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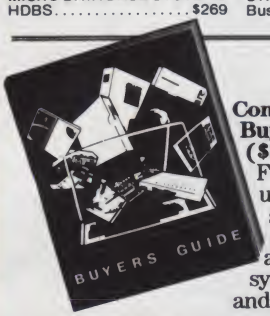
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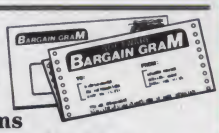
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organized. The first two micro floppies mount within the main unit and take up an insignificant amount of space. The main unit has room for two expansion modules, but the modules must not require any external connections. Memory or cache disks are ideal candidates for this position.

The next three expansion modules mount in a unique way—the main unit literally grows to accommodate them. The power supply is on a sliding tray and forms the rear of the main unit. When you slide the power supply away from the main unit, a gap is formed where the expansion modules, which are in their own small cases, can be inserted.

Except for the monitor, a powerful system can be assembled as a single unit. However, there are some inherent disadvantages to all of this neat packaging: the keyboard is permanently attached to the main unit, a fan is required for air movement and independent hardware houses will have the added problem of supplying cases for some of their expansion modules.

The Main Unit

The micro floppies have a tendency to steal the show, but the main unit, the SMC-70, is the heart of this system. The SMC-70's vital statistics are listed in Table 1, but a few more observations are in order.

1. The video RAM is mapped into the I/O space, thus freeing the main memory for programs and data. Although accessing the video RAM with I/O instructions may be a little inconvenient, it's still preferable to using up a sizable hunk of main memory.

2. The character font is programmable. The default font uses one-dot descenders. Each character can have blink and inverse attributes set individually.

3. The video display consists of three overlaid planes: characters, graphics and background, with characters having priority.

4. The SMC-70 interfaces directly to two kinds of monitors: monochrome and high-resolution RGB (red/green/blue). A television interface is available, but at $200 it's a dubious option. Caution: High-resolution RGB monitors are expensive, yet once you see the SMC-70 working with one, it'll be hard to settle for monochrome.

5. Interlaced scanning is used in the super high-resolution mode (640 × 400 B/W pixels). This means that the monochrome monitor should have a long decay phosphor to avoid flickering.

6. The keyboard is serviced by an 8041A, a microcomputer that is configured as an intelligent peripheral interface. The 8041A takes care of scanning the keyboard, forming the key code (including the programmable function keys), repeating the key if it is held down (timing is programmable) and interrupting the Z-80A when a key is depressed (optional).

7. A help key is provided, but it is not used in any of the built-in software.

8. The keyboard does not extend far enough for a palm rest.

9. There is an excellent set of edit keys, including four logically arranged cursor keys.

10. The F and J keys have dimples to aid in touch-typing. This is especially important on a computer keyboard where the hands are often leaving the home positions.

11. Cables do not come with the unit, and hard-to-find eight- and 13-pin DIN style plugs are required. (I hope Sony realizes its error in doing this.)

12. The Basic reference manual, the system monitor manual and the hardware reference manual do not come with the unit. Only the operating instructions and two reference charts are included. This is carrying unbundling much too far. It's like buying a computer and finding that the CPU chip is not included. Documentation is a necessary component of any hardware or software product; the product is incomplete and unusable without it.

To add insult to injury, Sony charges $28 to $43 for each of the manuals, and they weren't even available until about a month after the system was first marketed. (By the way, the ROM Basic and System Monitor reference charts that do come with the unit are handy.)

13. The ROM Basic supplied with the unit is complete with powerful graphics commands. Sony Basic runs close to the speed of Applesoft.

Since floating point numbers in Sony Basic have 14 significant digits, Sony Basic is a little slower than Applesoft during number crunching. On the other hand, it is a little faster during other processing.

14. The system monitor is surprisingly powerful for a business system. It has a mini-assembler, disassembler and a memory and peripheral test, as well as access given to the monitor's

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utility subroutines.

15. The SMC-70 has a built-in clock/calendar with battery back-up.

16. The fan is a bit noisy, but the rest of the unit has a solid feel.

Micro Floppy Disks

I intended to put an eight-inch drive on my system, but after seeing the micro floppies, I quickly changed my mind. In a word, they're cute! But that's not all. Each disk holds 280K, and the drives are fast and quiet. Imagine carrying a megabyte of data in your shirt pocket.

The micro floppies are 3½ inches in diameter and are in a rigid plastic case. You can slide a shutter over the head access slot when the floppy is not in use. The rigid case and the shutter ensure that the magnetic medium is well-protected.

Whether or not Sony's micro floppy format will become an industry standard is still up in the air.

In response to Sony's introduction of the micro floppy, a number of disk drive manufacturers quickly got together and formed a standards committee—a well-used technique to take the wind out of the sails of a manufacturer who is early to market with a product. It is interesting to note that Hewlett-Packard has just released its Series 100 and Series 200 computers with the Sony drives. Also, Tandon is planning to produce a compatible drive early next year.

One sour note is that the micro floppy drive does not come with an operating system. CP/M is another $150. A disk version of Sony Basic is also sold separately for $150. Although Disk Basic is powerful, it's a bit expensive for a second language. I say "second" because I installed an AMD 9511A math chip and used Forth with it to obtain an impressive performance.

Software

Sony is after the small-business market, judging from the first available software. Table II lists application software that is available. Apparently all of this software was produced in the U.S. The database management system is by Condor Computer and the accounting system is by SSG.

As far as languages go, there is a disk version of Sony Basic, and Pilot Plus with CB-80 is planned.

Conclusion

By getting one of the first machines marketed, I knew I was inviting trouble. So far, that trouble has manifested itself as lack of information and support, but the start-up problems are mostly solved now and there *is* support. I'm happy to say that I have not flushed out any hardware bugs yet.

The dealers have an "800" number to call for help on technical questions, but Sony's most knowledgeable people tend to be tied up with computer shows and the like. Users with a business configuration of all Sony components running Sony-supplied software will probably have things run fairly smoothly. The technical types, though, will have a few trails to blaze.■

CPU

Processor: Z-80A.
Clock: 4.028 MHz.
Interrupts: Nonmaskable and mode 1.

Memory

Main memory: 64K bytes (64K bit dynamic RAMs).

Video RAM:
- Graphic—32K bytes (16K bit dynamic RAMs).
- Character—2K bytes (static).
- Attributes—2K bytes (static).
- Font table—2K bytes (static).

ROM: 32K bytes total.
- System monitor—9K bytes.
- Sony Basic—22K bytes.
- Default font—1K bytes.

Display

Character display: 8×8 dot matrix/character; 80 or 40 characters by 25 lines; eight colors.

Border area: 16-color.

Output interface:
- Color—RGB analog signal; TTL level separate sync signal; composite sync signal.
- Monochrome—Composite video signal, TTL level separate sync signal.

I/O Interface

Keyboard: Encoded with 8041A microprocessor; 72 keys; eight display control keys; five programmable function keys; one help key (programmable); numeric keypad interface.

Audio cassette: Eight-pin DIN jack; 1200 b/s baud rate; motor on/off switch.

Printer interface: 25-pin D connector; TTL level; standard eight-bit parallel transfer. RS-232C interface: 25-pin D connector; TTL level; 75-19,200 b/s baud rate; implemented with 8251A.

Speaker: Eight ohms, three levels.

Earphone: Minijack.

RGB video output: 25-pin D connector; 0V-0.7V, 75 ohms.

Monochrome video: Eight-pin DIN jack; 1 Vp-p, 75 ohms, sync negative.

Light pen interface: Five-pin DIN jack.

Slots for expansion (50-pin connectors):
- Inside—Two slots.
- Outside—Three slots.
- Maximum current—2.4A at +5V.
 1.2A at +12V.
 70mA at −12V.

Expansion unit: 50-pin connector.

General

Dimensions: 14.5×3.625×17.5 inches.

Weight: Ten pounds, nine ounces.

Price: $1475—main unit; $650—single micro floppy drive; $1100—dual micro floppy drives; $5—micro floppy disk; $90—numeric keypad.

Table 1. Complete list of the Sony SMC-70 specifications.

Operating System

CP/M.

Languages

Sony Basic.
Sony Disk Basic.
CB-80.
Pilot Plus.

Word Processing

Letterwriter.
Word Processor.
Spelling Checker.
Mail List.
W/P Math.

Spreadsheet

VisiCalc.
SuperCalc.

Accounting System

General Ledger.
Accounts Payable and Receivable.
Order Entry System.
Payroll System.
Inventory Control System.

Database Management

Record Management System.
Report Generator.
Database Management System.

Communications

On-line Communications (IBM 3275).
Batch Communications (IBM 2780/3780).
TWX and Database Access System.
Multiterminal Emulation.

Table 2. Software for Sony's SMC-70.

TS-1000 Printing Power For Under $100

Timex-Sinclair's lowest-priced printer for the lowest-priced micro is no toy. It can capably do the job—and at a fraction of the cost.

By Jim Stephens

Timex-Sinclair has done it again! Its new, redesigned model 2040 printer far exceeds its first model. But, more importantly, the printer is available on a local basis. That is, you can buy it at your local Timex-Sinclair distributor. Will wonders never cease!

Sinclair Research promised a printer when the early ZX-80 units were introduced in 1980. They even were able to market a small printer overseas and in Canada. The first one had several handicaps, such as four-inch, metallic-coated paper that had a tendency to jam if it was allowed to stay in one spot on the roller for a long time.

The few units that were "smuggled" into the U.S. were not impressive, but they were the only ones available that responded directly to the ROM's printer commands. However, they did do a reasonable job of printing. I waited a year for my printer, mainly because I couldn't get one locally. Now that I have my new model, the wait was worth it.

I had seen a few advance photos of the new 2040 printer, but based on past experience I felt that production probably was still about six months away. To my surprise, a full-page newspaper advertisement featured the printer at a discount price a week after I had seen the advance photos!

Still unbelieving, I called the store. Sure enough, they had more than 20 units in stock at this one outlet alone. I was there when the doors opened. The clerk said she had sold four printers the night before the advertisement came out.



The Timex-Sinclair 2040 thermal printer is compatible with both the TS-1000 and TS-2000 computers. The printer incorporates a dot matrix print mechanism with full graphics and text capability. It prints two lines per second in two modes.

Sizing Up the 2040

The 2040 measures 2×6×8 inches of black, high-impact plastic, and is larger and heavier than the original Sinclair printer. It weighs in at about three pounds, which is almost three times the size and weight of the original model. The printer comes with its own heavy-duty power supply. This supply is a wall-plug-type unit similar to the original supply, but is more than twice as large. Output of the supply is 24 volts at 1.2 amps!

The best news is that the paper is now white, 4¼ inches wide, and of a high-quality thermal specification. The earlier model had a width of only four inches and looked like burnished aluminum. The new paper is supplied in lengths of 85 feet, and fits into a paper tray that is covered with a clear plastic dust cover. The new model is similar to the design of the CAI P40 printer, which is also made for the ZX-81 and TS-1000 computers.

Address correspondence to Jim Stephens, 2324 Dennywood Drive, Nashville, TN 37214.

The print is 5×7 dot matrix of 32 columns. The print speed is a quiet two lines per second, which means a full screen can be copied in less than 12 seconds. Unlike the CAI P40 printer, the 2040 responds to the LPrint, LList, and copy commands directly rather than having to peek and poke memory locations for operation. The new unit has its own power on/off switch and, by holding the on switch down, the paper can be advanced manually. This is a necessary function, since the last line is below the tear-off blade when the last print line is completed.

Operation

The new printer comes supplied with an eight-inch, permanently attached interface cable terminated with a backplane connector/adapter. The connector is attached to the backplane of the TS-1000, and the 16K RAM Pack is connected to the adapter by a feed-through extension board. The RAM Pack now will be located about two inches away from the computer, making it appear rather unstable. However, no problems have been experienced with wobble.

For operation, the printer cable is attached to the TS-1000, and the power supply is plugged into the wall outlet. The printer is switched on manually and the TS-1000 is activated. It doesn't appear to matter if one of the units is off. I accidentally left my printer on for 24 hours and it still operated perfectly the next day. The two regulators under the vents on the right side were giving off plenty of heat. I suppose the extra power supply is necessary, but I detest all that extra cable cluttering up my limited work space.

The documentation is brief, but adequate. A built-in test procedure is described to determine if the printer is operational. This test consists of holding down both the on and the off switch simultaneously. This automatically prints alternate rows of "eights" and "ones." If this test is passed, you are ready to use the printer commands.

LPrint is a direct command that prints all of the characters in the quotation marks following the LPrint. LList lists out your entire program unless the break key is pressed. The copy command copies the entire screen to the printer. All of the screen will be printed even though there may be just one line on the display. This can waste a lot of paper. When the printer is operating, the display acts as though it is in the Fast mode. This can be irritating, but I'm usually watching the printer do its thing.

The instruction manual gives most of its attention to explaining what to do to avoid damage to the printhead. The use of the supplied paper is highly recommended, since low-quality paper can "ruin the print head in a few minutes of operation," according to the instructions. Apparently, the printer is fragile and subject to serious damage if the printhead is jammed.

I had one moment of panic when I first turned on the printer and my TS-1000. The display was not operating! All I could get were skewed black lines. After I quickly turned everything off and reconnected all of the plugs, no further problems were experienced.

The 2040 is by far
the best printer for the price.
It is small and portable.
It operates with
the ROM Basic
and never misses a character.

Watching this little printer quietly spew out characters at two lines per second is fascinating. I had expected a horrible churning noise like that of my little printing calculator, which sounds like it's grinding coffee. The 2040 printer is hardly audible over the sound of the television, the kids, the dogs and the radio.

The instructions end abruptly with a short paragraph describing how to use the printer with machine code. They describe how the use of the Out instruction activates and deactivates the printing mechanism. This information will be useful for machine-code programs that require the use of the printer.

A Look Under the Hood

Even though it probably voided the warranty, I could not resist a peek at the mechanics of the most inexpensive printer on the market.

After carefully removing the four retaining screws, I lifted off the bottom, which exposed an excellent-quality printed circuit board made by Alphacom. The fact that it was produced in Taiwan was not discouraging, since almost everything seems to be made in Taiwan these days.

Turning the board over reveals a sparsely populated component side that's dominated by one 40-pin 8224IC and four others of unknown makes and models. I was most interested in the printhead mechanics, and explored this to the greatest extent.

The printing is done by a pair of two-inch stationary thermal wafers connected to the board by ribbon cable. The wafers, which are flat against the platen, do move from side to side about ⅛-inch to produce the characters' horizontal dots. The movement is driven by a plastic cam, and return is done by a spring. This will be a large source of wear. The roller and wafer cam are driven by nylon gears that have sensing switches for information on starting and stopping.

There is a lot of metal within the case, but it is mainly die-cut and stamped, with no machined or precision parts. This would explain the low cost. I see no reason why this mechanism would not last for thousands of cycles, other than the one nylon cam used to shift the printing wafers.

With little movement of the heads, no impact printing and the use of quality paper, this little printer should easily last the life of the system.

The Best for the Bucks

The 2040 is by far the best printer available for the price. Actually, at $99.95, it's the only printer for its price! It is not full-size, will not print on plain paper, and can't compare to the more sophisticated units, but it does the job at a fraction of the cost.

With the printer, your computer can now do many things like the big ones. It can generate hard copy that can be used for such things as records management and program debugging, and, with the proper formatting, it can even be photocopied using two 11-inch lengths for a complete 8½×11-inch printed report. The thermal print photocopies beautifully.

The extra power supply is a nuisance, and it lacks the frills of a software-controlled power on and off. These shortcomings, however, can be overlooked when you consider the advantages. It is small and portable. It operates with the ROM Basic and never misses a character. It is quiet and the cost can't be beat. Now where is that minidisk?■

Increase the Power of CP/M

If you find CP/M lacking in some areas, this utility program will provide more power to you and your micro.

By Mitchell K. Hobish

The way that CP/M has virtually taken over the marketplace for eight-bit microcomputer operating systems testifies to its utility. However, it's been described as less than "user friendly"—a capacity to which all interfaces between the human operator and the computer should aspire.

For this reason, several "front ends" (programs that provide some of the capabilities CP/M *should* provide) have appeared.

Microshell and Unica supply several CP/M enhancements, many of which emulate Bell Labs' Unix, the sometime-contender in best-operating-system debates. While these programs allow greater flexibility in terms of program redirection, they do not allow access to all the data extant on a disk. And, while Microshell, for example, supports multiple statements on a command line, it's still rather cumbersome if you want to copy several files from one disk to another.

Command	Funtion
CHECK	Calculate checksum for file.
COPY	Transfer files.
DIR	Directory listing.
DISK	List disk parameters.
DS	Display and substitute hex code.
DUMP	Dump ASCII code.
DUMPA	Dump formatted ASCII code.
DUMPH	Dump formatted HEX code.
DUMPX	Dump formatted ASCII and HEX code.
ERA	Erase files.
EX	Execute program at given address.
EXIT	Leave Power, go to designated address.
FILL	Fill memory with specific HEX byte.
GO	Load a program and execute.
GROUP	List group numbers of files.
JP	Jump to entered address.
LOAD	Load a file to given memory address.
LOG	List POWER default settings.
MOVE	Move block of memory.
READ	Read track and sector.
READGR	Read group.
RECLAIM	Recover erased files.
REN	Rename files.
RUN	Run a .COM program from Power.
SAVE	Save file from memory.
SEARCH	Search memory for string.
SETDIR	Set file to $DIR.
SETRO	Set file to $R/O.
SETSYS	Set file to $SYS.
SETWR	Set file to $R/W.
SIZE	List size of file in sectors and bytes.
SPEED	Set display speed.
STAT	List free and used disk space.

Table 1. Listing of commands available with Computing!'s Power utility program.

More Power to You

Enter another utility program: Power, from Computing! (2519 Greenwich, San Francisco, CA 94123). Actually, this is a package of about 50 programs. Since the cost of the package is $169, it averages out to a little over $3 per utility program—quite a bargain when you consider what you get. (See Table 1 for a listing of the available commands.) The program requires about 12K of memory, beginning at 100H.

Most of the programs supplied are menu-driven. That is, entry of one of the utility names at the keyboard (for example, Copy) results in a listing of all the files, each with an associated number, on a disk to the CRT. Merely enter the number of a file (or series of files, or all the files) and the destination drive, and the files will be transferred appropriately. Try that with PIP!

The same format holds for utilities that rename files, reclaim previously erased files, load, generate the size in sectors and bytes, and on and on. The

Address correspondence to Mitchell K. Hobish, Laboratory of Chemical Evolution, University of Maryland, College Park, MD 20742.

use of numbered files helps alleviate the problem of typing erroneous file names; it also saves time.

Power also allows you access to specific sectors and groups on the disk. This data may be loaded into memory at a location you designate, and may then be operated on appropriately, before being written back out to disk to the sectors you designate. Never before has the CP/M operator had such control over information stored on disk.

Useful Commands

One of the commands I find particularly useful is TEST. This nondestructive test of the designated disk results in generation of a unique CRC checksum. It also identifies bad sectors and collects them into a special file, designated SYSTEM. Hence, it's invisible to the user; CP/M will never attempt to write data to those sectors. This is an excellent way to assess the integrity of any disk—especially those that may appear to be "bargains."

Another aspect of the user-friendliness of the package is the way it allows use of the semicolon as a delimiter between disk drive designation and file name (e.g., B;filnam.ext).

Furthermore, I have always found onerous the necessity of shifting to get an asterisk, unshifting to get a period, and then shifting again to get another asterisk for complete wild-card commands. Well, Power takes care of that, too; a simple "**" will be handled appropriately.

Never before has the CP/M operator had such control over information stored on disk.

There are times when I would prefer differently formatted directory listings and other customizations. Through the Log command, the user can set any number of columns for listings, set Page on or off (number of lines read out to CRT before stopping and waiting for a <CR> for the next page) and show system files in directory listings. Even the speed at which text is read out to the CRT may be varied.

And there's more... Through the DS command, several bytes of Power's code may be modified to provide more customization: prompt-changing, sign-on message, characters per line and so on. The modified code may be saved to disk for a completely personalized package.

Pick Up Power

The only area I found even slightly lacking was the documentation; the manual in the package I received had blurred and missing letters. I would have preferred that the manual be oriented vertically along the long axis of the page instead of the horizontal format currently supplied. In addition, I found that several of the commands were incompletely documented.

These are mere quibbles, however. I would strongly recommend this powerful addition to CP/M for anyone who wants more access to files on the disk. Power is an excellent buy—made even better by a money-back guarantee.■

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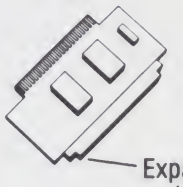
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How to Succeed in Business
(with a little help from Apple)

Learn the secret of success in business with this Apple II program that analyzes your company's sales and cost figures.

By Gregory Glau

One of the best things businessmen can do is to analyze profit projection figures. It's really helpful to get a line on what may happen to your sales/costs/profits.

Unfortunately, many of us look in only one direction: forward. It seems that most businessmen are optimists, so we naturally expect sales to grow, assume our profits will rise right along with them and think we'll cut overhead to the bone at the same time.

Look in Both Directions

The Break-even program (Listing 1), written for the Apple II, allows the businessman to look at his sales and cost figures from *both* directions. In other words, it allows us to simulate the bottom line (profit or loss) for our business—based on conditions that we set. And more than that, it prints out a range of amounts developed from this simulation criteria.

We control not only the starting figures for sales and costs, but also the way in which these figures will vary for any particular simulation we'd like to see. Our simulation also can cover any time period we wish. We can use year-end figures, amounts for one month or for one quarter or whatever.

To keep things simple, we'll work with three amounts: Sales, Direct Costs and Overhead.

The Sales category is just that—your total sales for whatever period you want to use.

Direct Costs deals with the labor and materials involved in producing whatever you sell. In a manufacturing business, Direct Costs would include the raw materials, plus the labor required to create the product, plus any other costs directly associated with the production of the items. In a retail business, Direct Costs consists of material purchases, freight and any labor directly connected with selling your product.

Overhead involves expenditures such as administrative salaries, bookkeeping costs, insurance expenses, utilities and office supplies. Overhead, simply, is what it costs just to open your doors every day, whether or not you sell anything.

A financial statement normally will total and list Sales, Direct Costs and Overhead. When you deduct your costs from your sales, what's left is your net profit.

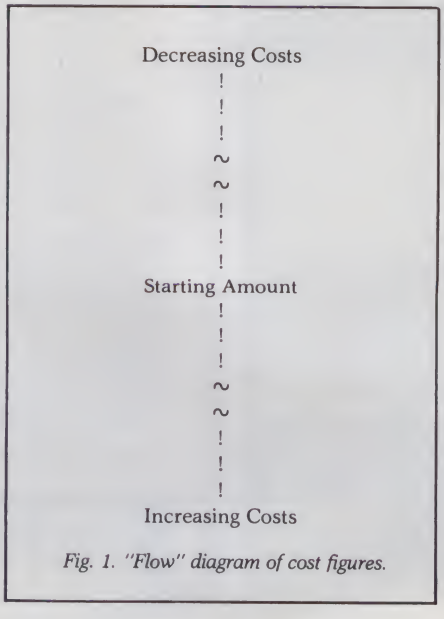


Fig. 1. "Flow" diagram of cost figures.

We'll keep things simple and work with only these totals because we want to create a clear simulation of what will happen to them if your business gets better or worse—if sales and costs increase or decrease.

All of this is based on your own data, of course. The program's printout lists your sales along the top and your costs up and down the left side. Remember, though, that we want to see a range of values, so your starting figures will be in the middle of the others.

For example, say you enter $400,000 for your sales figure. Let's also assume you want to see a four percent range for your sales. Here's what the top line of your printout will show:

Sales Volume→
353894 368640 384000 400000 416000 432640 449945

Notice your $400,000 starting sales figure in the middle of the other amounts.

For your sales, the printout shows your starting figure, plus three dollar values for increased sales and three figures for decreased sales, all according to the percentage you select.

To the right of your starting figure, sales are increased by four percent each year. These amounts are cumulative, percentage-wise; each year they are four percent higher than the previous year.

To the left of your starting figure,

Address correspondence to Gregory Glau, PO Box 1627, Prescott, AZ 86302.

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Circle 59 on Reader Service card.

Listing 1. Break-even program for the Apple II.

```
100  DIM C(21): REM  THIS DIMENSIONS OUR COST FIGURE TABLE
110  HOME : PRINT : GOSUB 11000: PRINT
120  PRINT
130  PRINT "ANSWER 1 TO SKIP THE INSTRUCTIONS"
140  PRINT "AND GO RIGHT TO THE DATA-ENTRY AREA."
150  PRINT
160  PRINT "ANSWER 2 TO SEE THE INSTRUCTIONS"
170  PRINT "AND THEN ENTER DATA"
180  PRINT : PRINT "ANSWER 3 TO STOP NOW.": PRINT
190  INPUT Q
192  IF Q = 1 THEN 1000
194  IF Q = 2 THEN 200
196  IF Q = 3 THEN  PRINT "END OF PROGRAM": END
198  GOTO 110
200  HOME : PRINT : GOSUB 11000: PRINT
210  PRINT "THIS PROGRAM WILL ALLOW YOU TO ENTER"
220  PRINT "YOUR SALES VOLUME AND COST DATA, AND"
230  PRINT "THEN WILL PRINT A CHART FOR YOU, BASED"
240  PRINT "ON YOUR OWN INFORMATION."
250  PRINT
260  PRINT "TO KEEP THINGS SIMPLE, WE"
270  PRINT "ONLY ENTER YOUR TOTAL SALES VOLUME, AND"
280  PRINT "THE TOTAL OF YOUR 'COST OF SALES.'"
285  PRINT
290  PRINT "THIS INCLUDES YOUR DIRECT COSTS, SUCH"
300  PRINT "AS LABOR AND MATERIALS. YOU ARE ALSO"
310  PRINT "ASKED TO ENTER YOUR OVERHEAD COSTS."
320  PRINT
330  PRINT "THE TOTAL OF THESE TWO - DIRECT COSTS"
340  PRINT "AND OVERHEAD COSTS - WILL BE"
350  PRINT "YOUR TOTAL 'COST OF SALES.'
355  PRINT : GOSUB 11000: PRINT
360  PRINT "HIT ANY KEY TO CONTINUE..."
370  GET A$
380  HOME : PRINT : GOSUB 11000: PRINT
390  PRINT "YOUR SALES DATA WILL BE PRINTED IN"
400  PRINT "SEVEN COLUMNS, WITH THE INITIAL "
410  PRINT "'STARTING SALES' IN THE CENTER. THEN,"
420  PRINT "SINCE YOU WERE ASKED FOR A PERCENTAGE"
430  PRINT "INCREASE/DECREASE FIGURE, THE COLUMNS"
440  PRINT "TO THE RIGHT AND LEFT OF THE 'STARTING'"
450  PRINT "SALES COLUMN WILL SHOW THIS AMOUNT"
460  PRINT "INCREASED (RIGHT SIDE) AND DECREASED"
470  PRINT "(LEFT SIDE) BY THE PERCENTAGE YOU"
480  PRINT "SPECIFIED."
490  PRINT
500  PRINT "THIS IS A CUMULATIVE PERCENT, BY THE"
510  PRINT "WAY, SO YOU CAN EASILY SEE WHAT "
520  PRINT "HAPPENS TO YOUR SALES IF THEY INCREASE"
530  PRINT "OR DECREASE BY THE % YOU ENTERED."
540  PRINT : GOSUB 11000: PRINT
545  PRINT "HIT ANY KEY TO CONTINUE...": GET A$
550  HOME : PRINT : GOSUB 11000: PRINT
560  PRINT "YOUR COST INFORMATION IS TOTALED."
570  PRINT "YOU ARE ALSO ASKED TO ENTER A PERCENT"
580  PRINT "THAT YOU'D LIKE TO SEE YOUR COSTS"
590  PRINT "INCREASE AND DECREASE."
600  PRINT
610  PRINT "THIS INFORMATION IS PRINTED AS THE"
620  PRINT "LEFT-HAND COLUMN OF YOUR PRINTOUT,"
630  PRINT "AND - LIKE THE SALES FIGURES - HAS "
640  PRINT "YOUR STARTING 'COST' AMOUNT IN THE"
650  PRINT "CENTER OF THE NUMBERS, WITH THE TOTALS"
660  PRINT "FOR YOUR COSTS INCREASING (GOING DOWN"
670  PRINT "THE CHART) AND DECREASING (GOING UP"
680  PRINT "THE CHART) ACCORDING TO THE PERCENT"
690  PRINT "YOU SPECIFIED TO START WITH."
700  PRINT : GOSUB 11000: PRINT
705  PRINT "HIT ANY KEY TO CONTINUE...": GET A$
707  HOME : PRINT : GOSUB 11000: PRINT
710  PRINT "BY READING ACROSS FOR SALES AND THEN"
720  PRINT "DOWN THE LEFT-HAND COLUMN FOR COSTS,"
730  PRINT "YOU CAN DETERMINE YOUR PROFIT OR LOSS"
740  PRINT "BASED ON WHAT MAY HAPPEN TO YOUR "
750  PRINT "BUSINESS."
765  PRINT : GOSUB 11000: PRINT
770  PRINT "HIT ANY KEY TO START...": GET A$
1000  HOME : PRINT : GOSUB 11000: PRINT : PRINT
```

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Listing continued.

```
1002  PRINT "YOUR STARTING FIGURE MUST BE A ": PRINT "POSITIVE AMOUNT.": PRINT
    : PRINT
1003  INPUT "STARTING SALES VOLUME ";S(4)
1004  IF S(4) <  = 0 THEN 1000
1006  HOME : PRINT : GOSUB 11000: PRINT : PRINT
1007  PRINT "REMEMBER TO ENTER THE PERCENT"
1008  PRINT "INCREASE/DECREASE AS A DECIMAL."
1009  PRINT : PRINT "FOR INSTANCE, 5% SHOULD BE"
1010  PRINT "ENTERED AS .05, WHILE 10%"
1011  PRINT "SHOULD BE ENTERED AS .10."
1012  PRINT : PRINT "1, THEN, IS THE SAME AS 100%."
1013  PRINT "THIS IS THE LARGEST YOU CAN GO.": PRINT
1015  PRINT "WHAT'S THE PERCENT"
1020  INPUT "INCREASE/DECREASE FOR EACH PERIOD ? ";PS
1030  IF PS > 1 THEN 1006
1035  IF PS < 0 THEN 1006
1040  HOME : PRINT : GOSUB 11000: PRINT : PRINT
1100  INPUT " DIRECT COSTS ";D
1150  HOME : PRINT : GOSUB 11000: PRINT : PRINT
1200  INPUT "OVERHEAD COSTS ";O
1210 C(11) = O + D: REM  C(11) IS OUR TOTAL COST TO START WITH
1215  IF C(11) >  = 1 THEN 1220
1216  HOME : VTAB 5: PRINT "YOUR DIRECT COSTS + OVERHEAD"
1217  PRINT "COSTS TOTAL LESS THAN ZERO."
1218  PRINT : PRINT "THEY MUST BE A POSITIVE FIGURE.": PRINT
1219  PRINT "ENTER ANY KEY TO START OVER ";: GET A$: GOTO 1040
1220  HOME : PRINT : GOSUB 11000: PRINT : PRINT
1230  PRINT "TO GET YOUR COST FIGURES TO GO"
1240  PRINT "UP AND DOWN THE SIDE OF YOUR PRINTOUT,"
1250  PRINT "WE NEED TO ENTER THE PERCENT YOU'D"
1260  PRINT "LIKE TO SEE THESE FIGURES "
1265  PRINT "INCREASE/DECREASE."
1270  PRINT : PRINT
1280  PRINT "REMEMBER, PLEASE ENTER THIS FIGURE AS"
1282  PRINT "A DECIMAL (10% = .10, 4% = .04, ETC.)"
1284  PRINT : INPUT "PERCENT INCREASE/DECREASE ";PC
1290  IF PC < 0 THEN 1220
1295  IF PC > 1 THEN 1220
1300  REM : NOW WE HAVE TO FIGURE SALES
1310  REM : AMOUNTS USING THE VARIABLES
1320  REM : S(1) THRU S(7)
1330  REM : S(4) WILL BE THE INPUTTED SALES AMOUNT
1340 S(5) = (1 + PS) * S(4)
1350 S(6) = (1 + PS) * S(5)
1370 S(7) = (1 + PS) * S(6)
1380  REM : NOW WE HAVE TO DECREASE THE AMOUNTS
1390 S(3) = (1 - PS) * S(4)
1400 S(2) = (1 - PS) * S(3)
1410 S(1) = (1 - PS) * S(2)
1500  REM : NOW WE HAVE TO FIGURE THE AMOUNTS
1510  REM : FOR THE COST FIGURES.
1520  REM : C(11) IS OUT STARTING COST TOTAL
1530  REM : LET'S FIGURE THE INCREASED COSTS FIRST
1600  FOR Y = 12 TO 21
1610 C(Y) = (1 + PC) * C(Y - 1)
1620  NEXT Y
1630  REM : NOW LET'S FIGURE THE DECREASED COSTS
1640  FOR Y = 10 TO 1 STEP  - 1
1650 C(Y) = (1 - PC) * C(Y + 1)
1660  NEXT Y
1700  REM : CONVERT TO INTEGERS
1710  FOR X = 1 TO 7
1720 S(X) =  INT (S(X))
1730  NEXT X
1740  FOR Y = 1 TO 21
1750 C(Y) =  INT (C(Y))
1760  NEXT Y
2000  REM : NOW WE WILL PRINT ALL THE DATA
2010  HOME : PRINT : GOSUB 11000: PRINT : PRINT
2015  PRINT "ENTER TODAY'S DATE, PLEASE:"
2016  PRINT : INPUT E$
2017  PRINT
2020  PRINT "ANSWER 1 TO PRINT..."
2030  PRINT "   (TURN ON YOUR PRINTER)"
2040  PRINT : PRINT "OR 2 TO STOP NOW."
2045  PRINT
2050  INPUT Q
2060  IF Q = 2 THEN  PRINT "END": END
2070  IF Q > 2 THEN 2000
2080  IF Q < 1 THEN 2000
2100  REM : PRINTING SECTION
2110 D$ =  CHR$ (4)
2120  PRINT D$;"PR#1"
2130  PRINT ""
2140  PRINT "      >>>>>>  BREAKEVEN CHART  <<<<<<"
2150  PRINT " ": PRINT " "
2152  PRINT "THIS REPORT WAS PRINTED ON ";E$;"."
2153  PRINT " ": PRINT "TO READ THIS CHART, FIND THE SALES FIGURE YOU WANT
    ON THE"
2155  PRINT "TOP LINE, AND THEN LOOK DOWN THE LEFT SIDE, THE COST LINE, UN
    TIL YOU"
2157  PRINT "FIND THE COST YOU WANT. THE FIGURE WHERE THE LINES"
2159  PRINT "INTERSECT IS YOUR PROFIT OR LOSS BASED ON YOUR SALES AND COST
    S."
2160  PRINT " ": PRINT " ": PRINT "THE INITIAL SALES VOLUME IS $ "; INT (S
    (4));"."
2170  PRINT "THE RATE OF INCREASE/DECREASE IS "; INT (100 * PS);" %."
2175  PRINT " "
2177  PRINT "THE TOTAL STARTING COSTS ARE $ "; INT (C(11));"."
2180  PRINT "AND THE COSTS ARE INCREASING/DECREASING"
2190  PRINT "AT THE RATE OF "; INT (100 * PC);" %."
```

More

Microcomputing welcomes conversions of this program for the Commodore, Heath, IBM and other popular microcomputing systems.

the amounts decrease by four percent each year. The figure immediately to the left of your starting amount is four percent lower than the $400,000 figure, the next is four percent less and so on.

So what you see is a range of values, based on your starting sales figure and the percent amount you enter to increase and decrease this amount.

If you want to see your sales increase/decrease at a 50 percent rate, or a three percent rate, the program will do it for you.

So for sales, you're asked for the starting sales amount, then the percentage of increase/decrease in decimal form (you enter ten percent as .10, 14 percent as .14, and so on).

Totaling Costs

Cost amounts are handled the same way. Since there are basically two things that make up your total cost of sales—direct costs and overhead expenses—the program asks for each one individually. It then totals them for you.

Then, the program will ask what percent you want to see your costs increase/decrease, as they run up and down the left side of the printout. Again, enter this as a decimal. This percent does not have to be the same as you use for sales. It can be whatever you want, depending on the simulation ranges you want to see.

The maximum you can enter is 100 percent (expressed as a decimal, this is 1). The program also won't allow you to enter a negative percentage figure, as it goes up and down anyway with your final figures. You can eliminate these restrictions, if you wish, by deleting lines 1030, 1035, 1290 and 1295.

Again, your starting value will be in the center of the other amounts. The figures going up from your starting amount show your total costs decreasing. The amounts going down from your starting figure show your total costs increasing (see "flow" diagram in Fig. 1).

The program also asks you for the current date; then it's ready to print.

If you make an error as you enter something, just continue on to the printing part; you can stop there and start over.

Your printer should be in slot 1; you can change this at line 2120 if your printer resides elsewhere. (See Table 1 for a list of the variables the program uses. See Fig. 2 for a complete printout of a simulation; the starting amounts and percentage increase/decrease fig-

Listing continued.

```
2195  PRINT : FOR Q = 1 TO 79: PRINT "-";: NEXT : PRINT " "
2196  PRINT " "
2197  PRINT "DIRECT COSTS"
2198  PRINT "PLUS OVERHEAD"
2199  PRINT "     !"
2200  PRINT "     !        SALES VOLUME --->"
2202  PRINT "     V"
2205  PRINT "           ";
2210  FOR X = 1 TO 7
2220 Z9 = S(X): GOSUB 15000
2230 Q9 =  LEN (Z9$)
2240  PRINT  TAB( 11 - Q9)Z9$;
2250  NEXT
2252  PRINT " "
2260  PRINT "          ";: FOR Q = 1 TO 70: PRINT "-";: NEXT
2290  PRINT " "
2300  FOR Y = 1 TO 21
2310 Z9 = C(Y): GOSUB 15000
2320 Z9$ = Z9$ + " !"
2325 Q9 =  LEN (Z9$)
2330  PRINT  TAB( 10 - Q9)Z9$;
2340  FOR X = 1 TO 7
2350 Z9 = S(X) - C(Y): GOSUB 15000
2360 Q9 =  LEN (Z9$)
2370  PRINT  TAB( 11 - Q9)Z9$;
2380  NEXT X
2385  PRINT " "
2390  NEXT Y
2400  PRINT "          ";: FOR Q = 1 TO 70: PRINT "-";: NEXT
2500  PRINT " "
3000 D$ =  CHR$ (4)
3010  PRINT D$;"PR#0"
3015  HOME
3020  PRINT "END OF PROGRAM": END
11000  INVERSE : PRINT "          >>>>> BREAKEVEN <<<<<          "
11010  NORMAL
11020  RETURN
15000 Z9 =  INT (Z9)
15010 Z9$ =  STR$ (Z9)
15020  RETURN
```

```
S(4).......starting sales volume

   S(1) - S(3) decreasing sales volume

   S(5) - S(7) increasing sales volume

D..........direct costs

O..........overhead expenses

C(11)......total cost of sales

   C(1) - C(10) decreasing total costs

   C(12) - C(21) increasing total costs

PS.........percent of increase/decrease for sales

PC.........percent of increase/decrease for costs

X..........counter for sales volume figures

Y..........counter for total cost figures

Q..........Input entry to continue the program

E$.........the date of the printout

Z9$........the amount as an integer

Q9.........the length of the printed amounts, so
           the chart will all line up properly

A$.........used in GET statements to read through the
           instructions
```

Table 1. List of variables used in Break-even program.

ures are shown for both sales and costs.)

We don't use commas in our printout, by the way, so we can print more amounts on the hard copy. And we don't try to put the same information on your screen; there are simply too many numbers to allow much comprehension.

The sales are in array S. This single-dimension array has only seven elements, so it's not dimensioned.

Costs are in array C, which is also a single-dimension array. However, it contains 21 items—your starting costs plus ten amounts higher and ten amounts lower. So, it *is* dimensioned in line 100.

Line Specs

Lines 110–190 ask if you wish to see the instructions for the program, and let you skip them if you wish. Lines 200–700 are the actual instructions; they summarize what we've covered here.

Lines 1000–1295 are the entry lines for the program, where you enter your amounts and percentages. The program also sees that the Sales and the total of Cost plus Overhead are positive figures. Since the amounts will both increase and decrease according to the percentages you select, you need to start with positive amounts.

Lines 1300–1660 do all the math to get your sales and cost totals and put them in their proper array niches. Lines 1700–1760 change your values to integers, so the math will be correct.

Lines 2000–3020 do the printing of the chart for you, and let you exit so you can start over if you've made an error in entering. Lines 11000–11020 make up a subroutine that prints the break-even line across the screen.

Lines 15000–15020 convert the amounts to strings (Z9$) so we can measure their lengths when we print them.

Out of the Red

Use this program to help determine your break-even point. Learn that if your sales drop X percent, your net profit will drop by Y amount. On the sample chart (Fig. 2), a five percent drop in sales causes a 100 percent decrease in profits.

You can use this program to determine exactly what figure you need to hold your total costs down to if your sales drop X percent.

Do you keep track of your sales and costs on a monthly basis? Then run a few simulations using various percen-

tages, grouped around your current monthly figures.

You'll soon see the relationships that exist between them. And, of course, you'll know your exact break-even points. You'll see how an X percent change in costs, coupled with a Y percent change in sales, will affect your bottom line.

You should do the same for your quarterly and yearly data. Run range printouts for any scenarios you can imagine. You'll have the exact bottom-dollar amounts on your printouts.

Situation Simulator

In effect, you can make this printout show whatever you want it to; you can use it to simulate any business situation you can imagine. And best of all, since its figures go both up and down, you can really learn from the information.

Considering the present economy, it's more important than ever to know what our bottom line will be if business isn't quite as good as we expect, and what it will be if costs increase faster than we anticipate.

This program will let you simulate almost any comparison focusing on sales vs cost totals.■

```
THIS REPORT WAS PRINTED ON 6/5/83.

TO READ THIS CHART, FIND THE SALES FIGURE YOU WANT ON THE
TOP LINE, AND THEN LOOK DOWN THE LEFT SIDE, THE COST LINE, UNTIL YOU
FIND THE COST YOU WANT. THE FIGURE WHERE THE LINES
INTERSECT IS YOUR PROFIT OR LOSS BASED ON YOUR SALES AND COSTS.


THE INITIAL SALES VOLUME IS $ 100000.
THE RATE OF INCREASE/DECREASE IS 10 %.

THE TOTAL STARTING COSTS ARE $ 95000.
AND THE COSTS ARE INCREASING/DECREASING
AT THE RATE OF 5 %.

-------------------------------------------------------------------------------

DIRECT COSTS
PLUS OVERHEAD
     !
     !        SALES VOLUME --->
     V
```

	72900	81000	90000	100000	110000	121000	133100
56880 !	16020	24120	33120	43120	53120	64120	76220
59873 !	13027	21127	30127	40127	50127	61127	73227
63024 !	9876	17976	26976	36976	46976	57976	70076
66342 !	6558	14658	23658	33658	43658	54658	66758
69833 !	3067	11167	20167	30167	40167	51167	63267
73509 !	-609	7491	16491	26491	36491	47491	59591
77378 !	-4478	3622	12622	22622	32622	43622	55722
81450 !	-8550	-450	8550	18550	28550	39550	51650
85737 !	-12837	-4737	4263	14263	24263	35263	47363
90250 !	-17350	-9250	-250	9750	19750	30750	42850
95000 !	-22100	-14000	-5000	5000	15000	26000	38100
99749 !	-26849	-18749	-9749	251	10251	21251	33351
104737 !	-31837	-23737	-14737	-4737	5263	16263	28363
109974 !	-37074	-28974	-19974	-9974	26	11026	23126
115473 !	-42573	-34473	-25473	-15473	-5473	5527	17627
121246 !	-48346	-40246	-31246	-21246	-11246	-246	11854
127309 !	-54409	-46309	-37309	-27309	-17309	-6309	5791
133674 !	-60774	-52674	-43674	-33674	-23674	-12674	-574
140358 !	-67458	-59358	-50358	-40358	-30358	-19358	-7258
147376 !	-74476	-66376	-57376	-47376	-37376	-26376	-14276
154744 !	-81844	-73744	-64744	-54744	-44744	-33744	-21644

Fig. 2. Printout of simulation of a break-even chart.



Hello thayuh. This is Eben Flow, proprietor of the Fish or Cut Bait Company, buyer and seller of lobstah bait for 49 years. My hobbies are collecting linoleum samples, squashing flies and playing pac-person on my home computer.

But here on Martinicus Rock, off the coast of Maine, the power can be a tad erratic. So, to cure the brownout and blackout problems, and to keep them spikes and surges off my picture tube, I got me a **MAYDAY** Uninterruptible Power Supply from SUN RESEARCH. Them fellas fixed me up real good and real light on my pocketbook, too. Got me a **MAYDAY** for my mini-calcaputer with a voltage regulator and everything for only 325 clams. They even included the battery in a nice waterproof box. Handy out here, you know. Now, if **MAYDAY** would only keep them sea dogs out of my barrel. . .

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Circle 244 on Reader Service card.

Printer Survival Kit

Shhh—the Infoscribe 1000 is printing. It's a heavy-duty, quality printer with the emphasis on quiet!

By Jim Hansen



The Infoscribe 1000 printer. This 200 character per second printer offers bidirectional, logic-seeking printing at 10, 12 and 16.5 characters per inch.



The printer case is of heavy construction, with plenty of sound-deadening foam rubber on top and bottom. The round dots at the top corners are magnets which mate with those on the bottom section of the case, used to hold the cover shut.

In this month's printer survival kit, we'll look at the Infoscribe 1000 dot matrix printer. This heavy-duty, 200 character per second printer, equipped with a sound-deadening case, is intended for continuous service.

Outside the Infoscribe

Externally, the Infoscribe 1000 is one of the more colorful printers on the market. The cream-colored injection-molded plastic case has a large, stylish red stripe across the front and down each side. The printer control panel is mounted on a partially recessed lip extending from the bottom section of the case.

The printer window is a 21×9¾-inch flat plate of plexiglass bonded to the top of the printer case. Visibility into the printing area is good.

The main ac line fuse, a classic toggle switch for power and a receptacle for the detachable line cord are located on the right side of the back panel. The other side of the back panel has a conventional Centronics-type interface connector and a dip switch used to set the baud rate and to stop bit selection for the serial interfaces.

The printer has two paper-feed paths—one underneath the unit (to be fed through a hole in the top of the printer stand) and one through a slot under the front lip of the case, for front-loaded paper. There is no provision for paper-feed from the rear of the printer. Paper is ejected through a slot near the top of the rear panel.

The paper path can handle form widths of 1.5 to 16 inches. Although I did not test this unit on multipart forms, the manual states that it will

Address correspondence to Jim Hansen, PO Box 234, New Boston, NH 03070.

print an original plus five copies. The forms-thickness adjustment knob is located on the left side of the printer mechanism, inside the case.

The Infoscribe 1000, manufactured by Infoscribe, Inc., 2720 S. Croddy Way, Santa Ana, CA 92704, offers a number of features that make it a versatile printer for line-printing applications on larger computer installations. These include character pitches of 10, 12 and 16.5 characters per inch (as well as double-width printing at half these densities), 80 or 132 columns per line, preprogrammed forms lengths of 11 and 12 inches, a programmable perforation skip, selectable auto-line-feed, printing at either six or eight lines per inch vertical spacing, two internally stored character fonts, downloadable fonts (those not stored in the printer, but sent from the host computer), a programmable VFU tape (this amounts to vertical tabs), super/subscript capability, and (with operator intervention and programming) underscore.

Infoscribe also offers bit-mapped graphics at 72 dots per inch, both vertically and horizontally. Although not tested, the implementation is conventional. Since both the horizontal and vertical resolutions are the same, no printer-induced distortion of graphics images will take place.

This printer can be ordered with several memory options to provide more print buffer (460 characters is standard, but up to 3K of additional memory may be installed). If downloaded fonts are used, some memory otherwise assigned to the print buffer is used to hold the fonts.

Three interfaces are standard with the Infoscribe. The standard Centronics-type parallel interface is most often used for local hookup. RS-232C serial and 20 mA current loop serial interfaces are also available. Both data terminal ready and X-On/X-Off signaling (to indicate when the printer is ready for more data) can be used with the RS-232C interface.

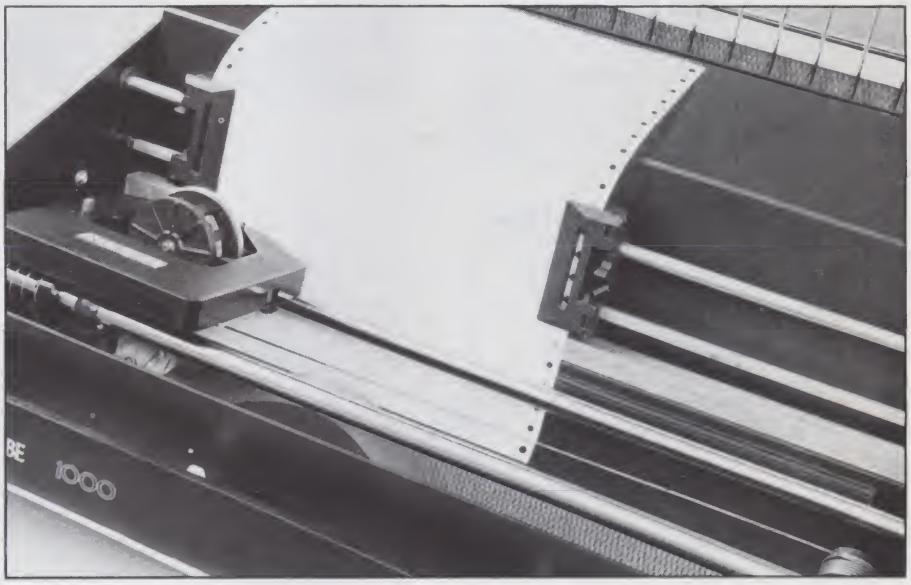
Inside

The internal mechanics layout of the Infoscribe is similar to others built under the same license. (The Datasouth DS180 printer, reviewed in the March 1983 *Microcomputing*, is built under the same license as this one.) The sideplates and most of the rest of the mechanism are made of aluminum.

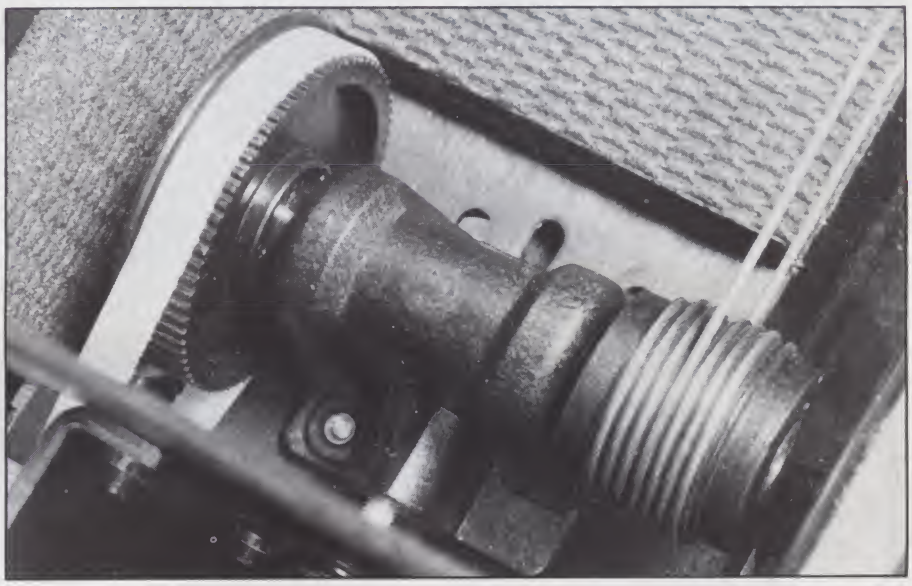
Paper motion is controlled by a stepper motor driving the tractors through a pulley-timing belt combination. Head motion is controlled with a dc servo motor driving a timing belt, which in turn drives a cable stretched across the printing bay. The cable is tensioned by repositioning a casting mounted to the printer frame. The ribbon is driven by a small dc motor mounted on the head carriage.

> The Infoscribe 1000
> is a versatile printer
> for line-printing applications
> on larger computer installations.

The electronics for the printer are contained in a well-shrouded enclosure in the back of the print area. The controller is Z-80-based, and was designed to use either 24- or 28-pin read-only memories, allowing for enormous expansion possibilities. Eight 2114 static random access memories provide 4K of memory. A CTC (a Z-80



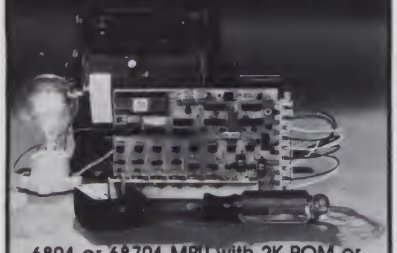
The printing bay of the Infoscribe 1000 is completely open. Any form up to 16 inches wide can be accommodated by the adjustable tractors. Printed text can be easily read as soon as it is on the paper. The cartridge-loaded ribbon and head is at left. Changing the ribbon is a one-handed job; it's easily snapped into place on top of the carriage. The ribbon motor, under the carriage, is a small dc motor. The head-to-platen adjustment is easily accomplished by turning a knob on the left sideplate.



The head cable tension, and thereby print quality, is maintained by sliding this casting left or right along the printer base. The timing belt shown around the large pulley passes through the right sideplate to a dc servo motor.

Circle 163 on Reader Service card.

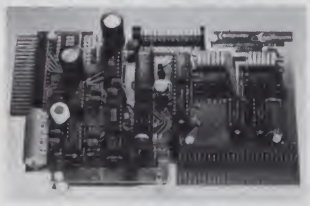
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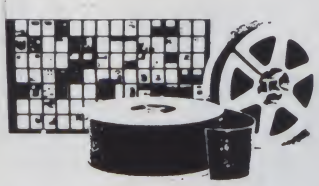
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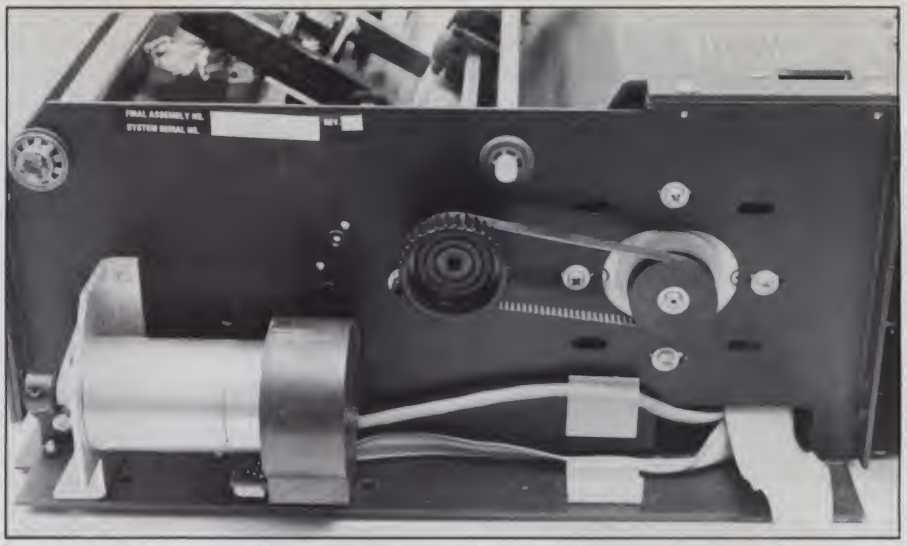
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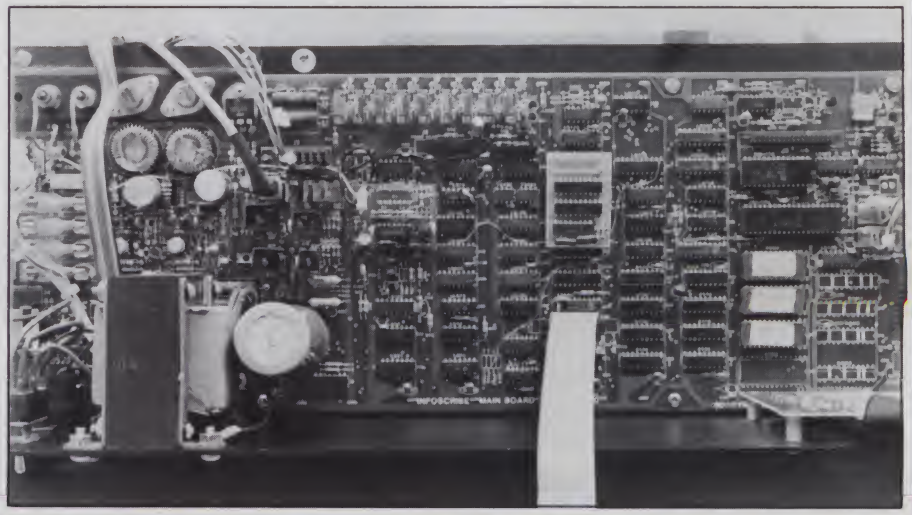
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The right sideplate of the Infoscribe 1000, showing the head carriage motor (which is servo-driven, rather than the more common stepper motor drive system) and the paper-feed motor and timing belt. The line-feed motor is of unusual power, not requiring reduction pulleys to increase torque as in many printers.



The controller board and power supply. The printer is operated from a rather small transformer. Power supplies and load circuits are fused internally with the four fuses shown here at the left end of the circuit board. The controller is Z-80-based, and has provision for 4K of RAM and sockets for four ROM or EPROM chips. Two character sets can be resident in the printer at a given time.

family chip) counter-timer is used to time controller operations.

The power supply, with the exception of the transformer, is mounted on the main controller board with separate fuses for the 5-volt, head, servo and paper-feed power. All are clearly marked for easy service. A considerable amount of rework was noted on the controller, including two "piggyback" boards, apparently added after the main board was designed.

The controller and power supply, as designed in this printer, are located in a nearly airtight box. No forced air or convection cooling was used to control the internal temperature.

This printer responds to a limited number of commands over the interface. Only lines per inch, character pitch density, character set selection, graphics or alphanumerics and super/subscript vertical paper-positioning may be set by controls from your computer. (You also can load fonts and set the VFU tape from your host computer.) There are no horizontal tabs or fancy paper-handling commands available.

The manual is straightforward and completely covers the printer in technical terms. It is printed on 8½ × 11 paper and punched for standard ring binders. Hand-drawn illustrations are used throughout the document and serve their purpose well. I found no omissions or obvious errors, but would guess that experienced users

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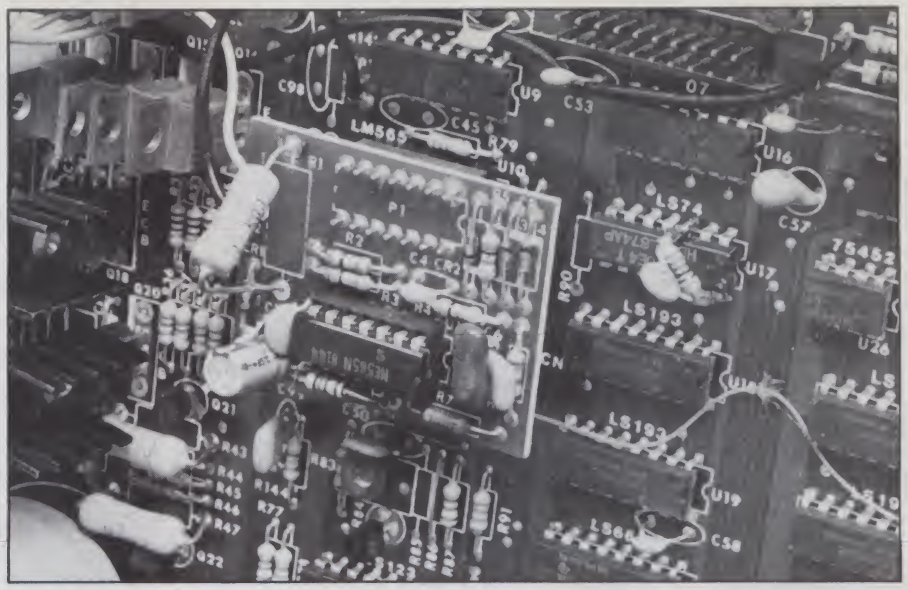
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Probably one of the biggest pains in the neck for an engineer is having to add or to modify a controller board after some purchasing agent went on a rampage and bought 10,000 boards before the need for the change was found. The Infoscribe 1000 evidently had this problem. Shown here is one of two piggy-back boards added. Notice the resistor/capacitor combination added across IC U17. This sort of problem happens to everyone (even the Japanese) and is no reflection on the manufacturer or design staff. Such changes usually do not degrade the reliability of the product; they just look bad and embarrass the engineer responsible.



The ac power switch, primary fuse and power cord connector. I included this photo in appreciation of the engineer at Infoscribe who stood his ground and put in a "real" switch—a toggle right out of the 1940s. I have always hated rocker switches, and at last I know I'm not alone. I wonder who my friend at Infoscribe is.

will find this manual easier to read than newcomers to the field.

Subjective Commentary

The Infoscribe's large, open printing bay that allows easy access for changing forms—as well as clear visibility of what is being printed—is an appealing feature. So is the heavy case, which was designed to keep printer noise under control.

I judged the Infoscribe very quiet for a tabletop printer of any speed, but I didn't measure it personally. The manual claims about 54 dB, compared to around 72 dB for a Selectric typewriter. The Infoscribe case's seals and acoustic foam have paid off, and I have no reason to doubt the noise-level figure given in the manual.

I missed not having a rear paper-feed path. Most tabletop printers (or most printers in general, for that matter) allow paper to be fed from the back of the unit; this one doesn't.

Also, no provision was made for a tear bar. Users must be careful when removing copy from the printer, or paper may be pulled out of the tractors and have to be reloaded.

The interface connector at the back of the printer is of high quality, but was not equipped with retainers to hold the interface cable in place. I had to reconnect the interface cable several times during my evaluation because it had vibrated loose during operation.

My biggest concern is what happens to the internal controller temperature on a hot day in the computer room. Being sealed as tightly as it is must make it hotter than necessary, which will ultimately cause semiconductor failure. (Semiconductor lifetime in terms of thousands of hours is keyed directly to operating temperature.) Evidently, Infoscribe was satisfied that the black structure around the controller radiated enough heat for

Line Length (characters)	Time to Complete 20 lines (seconds)	Throughput (characters per second)
20	4.5	88.8
40	7.0	106.6
80	11.5	139.1
7633 chars. of text*	75.0	101.7

*A preliminary version of this review was printed using an Epson QX-10 computer. The line length was set to 75 characters, and the text double-spaced. This is a typical type of printing job and gives a realistic idea of the actual real-life throughput of the printer.

Table 1. Throughput measurements for the Infoscribe 1000 printer. Except as noted, these tests were run from an Apple computer using a parallel interface card. The printer was set to ten cpi print density, six lines per inch.

sufficient cooling to take place.

The printer supplied for evaluation did not include a UL sticker. Whether this means that the printer has not been UL-tested, or that someone in production left it off is not clear. My personal inspection satisfied me that this is a quality printer; I would find it hard to believe that it doesn't meet or exceed UL standards.

While its print quality is not out of the ordinary, the Infoscribe is excellent in terms of overall execution. It's clearly put together by a manufacturing and engineering team that cares. ■

```
NORMAL DENSITY PRINT SAMPLE
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijk
lmnopqrstuvwxyz{|}~

DOUBLE DENSITY PRINT SAMPLE
! "#$%&'()*+,-./0123456789:;<=>?@ABCDEF
GHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijkl
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Fig. 1. Infoscribe 1000 print sample.

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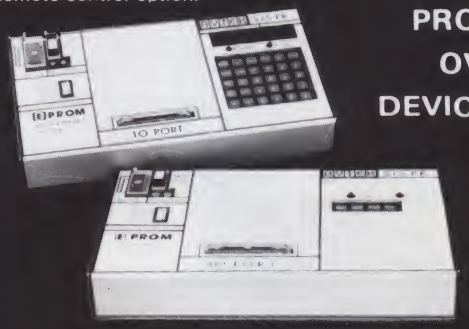
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A VIC Printer For the Do-It-Yourselfer

Dust off your ASR33 Teletype and put it to work with your VIC-20. All you need is this simple interface circuit.

By George R. Steber

It might seem strange that a peripheral device for a computer actually can cost more than the computer itself. Yet that's often the case with the VIC-20, which can be bought for less than $100.

A printer is a useful peripheral, but it's not absolutely necessary. It would be nice to have one for producing listings of Basic programs and other relatively simple data lists. In most other cases, the video display handles the input/output situation adequately.

Is there a cheap printer that can serve limited purposes?

A Low-Cost Printer

For years the workhorse of the minicomputer industry was the venerable ASR33 Teletype.

The ASR33 teleprinter is a serial device, with integral keyboard and printer, that uses the ASCII code. It is designed to operate at 110 baud and may be configured for RS-232 voltage levels or 20 mA current loop.

The best part of the ASR33 is that it can be found as a surplus item for a price of around $75 at hamfests or computerfests. That's enough to warm the heart of old Scrooge himself!

The next question, of course, is: How does the ASR33 work with the VIC-20? With a simple interface (it really is simple) and knowledge of some of the inner workings of the VIC, you can find out.

Printer Requirements

The first task is to locate an ASR33 for the job. The ASR33 teleprinter can be found in various types of configurations; unfortunately, this may cause some confusion for the neophyte.

The basic requirement for the ASR33 in this application can be stated simply. It *must* be configured for 20 mA operation.

A large number of ASR33s retired from service are already set up for the 20 mA operation. In these cases, no modification will be necessary. However, you may encounter one that is set up for RS-232 or something else. Your best bet in that case is to have someone familiar with internal wiring make the necessary change to 20 mA.

The ASR33 should be set up for 20 mA operation with two wires (which form the 20 mA loop) brought out of the machine for interfacing purposes.

Note that when the ends of the two wires are touched together, the machine will revert from the space mode to the mark mode. In other words, it stops "clunking" and starts "humming." This is a good preliminary check to see if your machine is working okay. The next step is connection to the VIC interface.

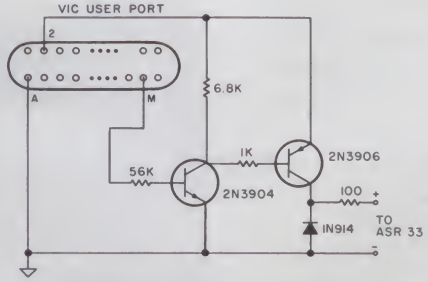


Fig. 1. VIC-to-ASR33 interface circuit.

VIC Interface

The interface circuit from the VIC-20 to the ASR33 is shown in Fig. 1. Power is tapped directly from the VIC; little current is needed. Only a few parts are required for the circuit. They should be readily available at your local parts store; total cost should be a dollar or so. All resistors are

Address correspondence to George R. Steber, 9957 N. River Road, Mequon, WI 53092.

¼-watt, ten-percent carbon types. The transistors and diode are common general-purpose items.

The interface is connected between the VIC user port and the ASR33 as shown. It will be powered up automatically when the VIC is turned on. I suggest that a 24-pin edge connector be connected to the user port. Do not solder directly to the VIC board. (This is a cheap design, but we have to draw the line somewhere!)

Mount the circuitry of the interface on a small PC board and install it in a convenient place. Use care in laying out the parts and check your work closely. If everything looks okay, plug it into the user port and the ASR33, and proceed.

When power is applied, the ASR33 should begin humming. If not, reverse the leads to the ASR33. If you cannot get the ASR33 to hum, your circuit probably needs work.

Printer Software

One fact you may not know is that the VIC has serial I/O routines already implemented in ROM. It's just a matter of calling these routines to output data to the ASR33. The best way to accomplish this is to open a channel (via RS-232 software in ROM).

A simple program to generate a listing of a Basic program stored in your VIC is shown in Fig. 2. This program may be entered any time, provided one caution is observed. The RS-232 software in ROM sets up buffers in the top 512 bytes of RAM. If you have a Basic program in RAM, it may not work properly if it uses this part of RAM.

There are ways around this problem. One solution is to reserve 512 bytes of RAM, hidden from your Basic program, for the RS-232 buffers. (The avid computer buff will, of course, find other solutions.) I saved 512 bytes of RAM by following the instructions at the start of the Basic program—POKE 52, 28 : POKE 56, 28.

When you've finished your listing or other printing task, be sure to print and close the channel. The necessary instructions to do this are shown in Fig. 2. This will divert all output back to the video screen.

To open the channel and list program on ASR33, type:
OPEN 128,2,3,CHR$(163)+CHR$(160):CMD128:LIST
To close the channel and return to video screen:
PRINT#128:CLOSE128

Fig. 2. VIC Basic commands to print on ASR33.

Voila!

So there you have it—an inexpensive VIC-20 printer. I've had mine in operation for several months, and I've found it to be helpful in listing and debugging Basic programs.

An additional benefit is that the ASR33 prints a full 80 characters per line and makes beautiful listings. (It should be noted that only uppercase letters are printed, and special symbols do not print because they lack valid ASCII codes.)

The ASR33 is not the most elegant printer available, but it's inexpensive and fairly reliable. Used sparingly, it should last quite a while in this application.■

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Do-It-Yourself Recorder For the VIC-20

Build this simple cassette interface circuit that lets you use an ordinary recorder with the VIC—and save yourself $70.

By Jim Brousseau

I bought my VIC-20 computer, frankly, because it was inexpensive. Consequently, I thought $70 was a bit too much to pay for a cassette recorder to store programs on. So to operate the recorder I already own with the VIC-20, I designed the circuit shown in Fig. 1.

To write a program onto cassette, the VIC-20 outputs a digital signal to pin E-5 of the cassette port. The circuit shown converts the digital signal to an analog-signal-level suitable for the microphone input of a cassette recorder. The CD4049 inverter and the LED provide a visual indication that the VIC-20 is outputting data to the cassette.

To read programs from cassette, the VIC-20 requires an active low-digital pulse on pin D-4 of the cassette port. The earphone output of the cassette recorder is converted back into a digital signal by the LM3900. Because the VIC-20 requires an active low pulse, inverter CD4049 is required.

The 5-volt relay and the 18-ohm resistor control the remote switch of the cassette recorder. When Load or Save is commanded, the VIC-20 turns on the 6.7 V cassette motor drive on pin C-3 of the cassette port. When this happens, the relay switches on, starting the cassette recorder.

Since I don't have an extra playback switch on my recorder, I chose to disable the cassette switch option by tying pin F-6 of the cassette port to ground. If you use this option with your VIC-20, you can tie pin F-6 to a switch.

This circuit is relatively immune to volume-level setting. The LED tied to the tape input to the circuit can be used to give an indication of input level.

I've used this circuit on several other computers and have found it to be effective. And it could save you $70.■

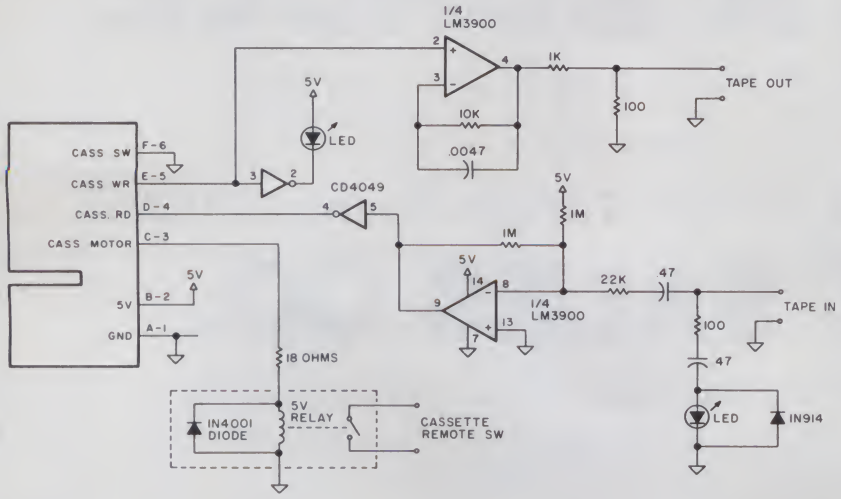


Fig. 1. VIC-20 cassette interface. Note: CD4049 pin 1 is 5 V, and pin 8 is ground.

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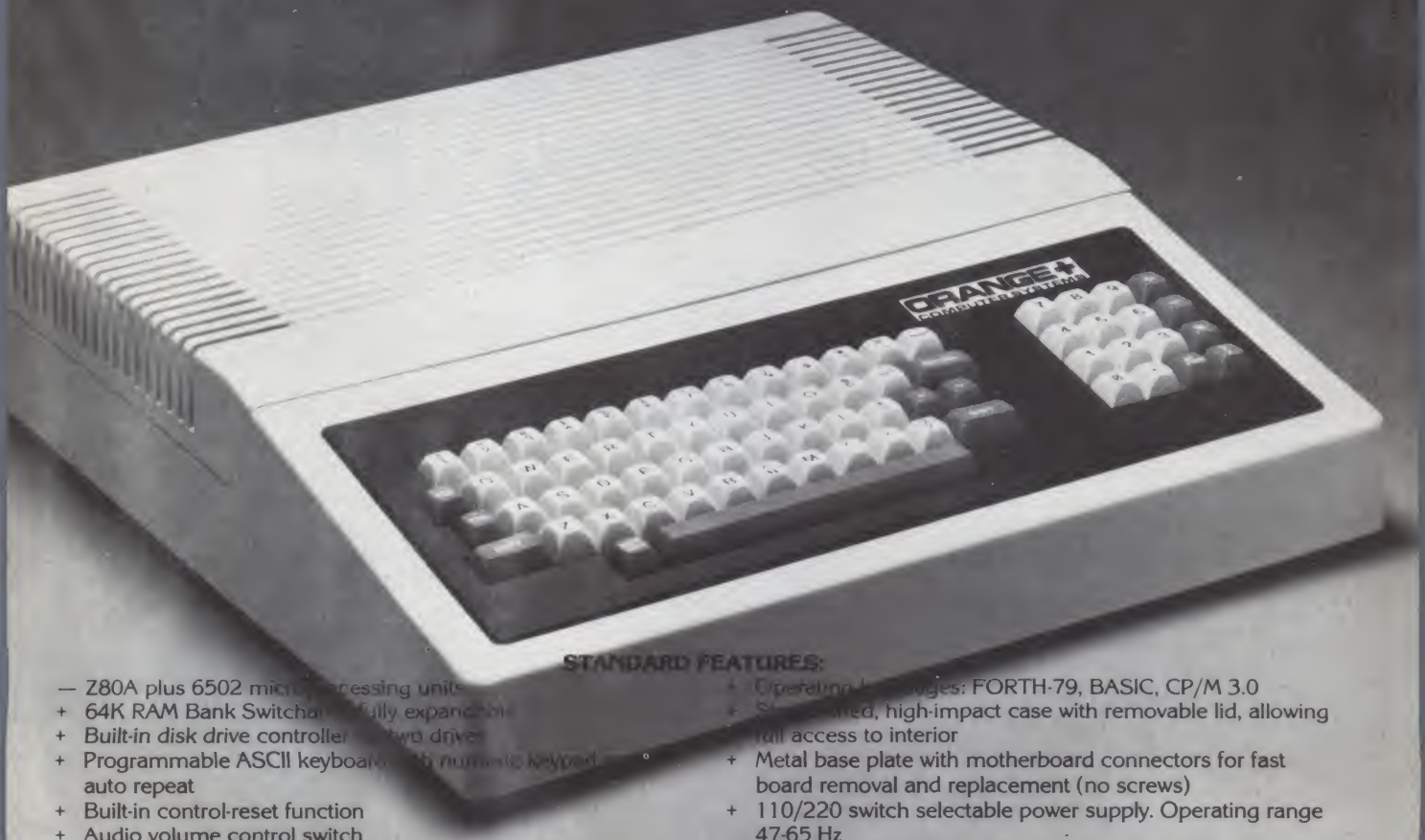
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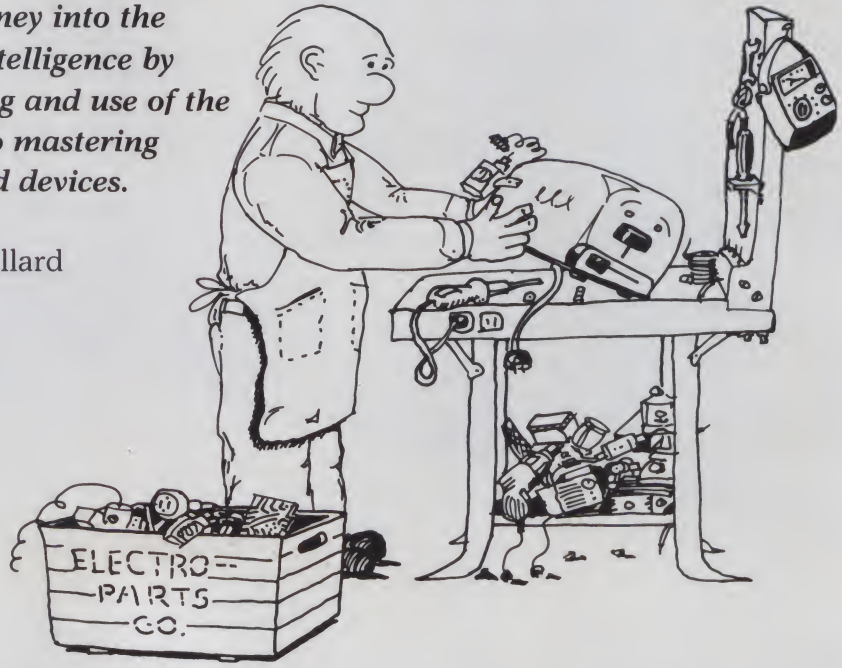
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The Intelligent Toaster

We continue our journey into the world of single-chip intelligence by exploring the programming and use of the Intel 8748 en route to mastering computer-controlled devices.

By Mark J. Robillard



You will find, in the pursuit of intelligent control, that the "computer-on-a-chip" will provide a cost-effective way of implementing a design. It offers an experimenter the flexibility of designing a complex control system that uses a small number of parts and isn't so tedious to construct.

In the March and May issues of *Microcomputing*, we began our venture into the world of single-chip intelligence with an in-depth study of the inner workings of one of these products: the Intel 8748. We covered the basic pin functions and dabbled a bit with instructions that had to do with accessing external memory. With this under our belt, let's move on.

Accumulator Instructions

Remember I said that all data moves go through the accumulator? Well, let's see just what operation can be done with this register. The following is a list of accumulator instructions:

INC A	CPL A
DEC A	SWAP A
CLR A	DA A

These are the accumulator instructions that utilize only the accumulator. (Register and logical operations involving the accumulator will be covered separately.)

Basically, the list includes some of the more simple instructions in the 8748 repertoire. INC A will add +1 to the value already there. If the previous value was FF (all 1s), an INC will reset the accumulator to zero. Upon doing this, however, the carry flag (not yet described) will assume a value of 1.

DEC will do the opposite. Every time it is involved, the value in the accumulator will decrease by one. CLR will reset the accumulator to all zeros. CPL will complement each bit.

If the value FF was stored into A before CPL was exercised, the value 00 would result. This instruction comes in handy if you have to invert data that is coming from a port, or if you have to output data to a port that is connected through open collector drivers. The CPL instruction would assure the correct signal polarity output.

SWAP is an interesting instruction. Have you ever started working with the lower four bits of a register, and then wanted to move them up to the high-order four bits? This type of operation is done frequently when building an address from hex keypad entry.

The SWAP instruction will perform an actual transfer of high-order nibble (D7, D6, D5, D4) for low order. The result you'll see in the accumulator looks like this:

Before	D7	D6	D5	D4
	1	0	1	1
	D3	D2	D1	D0
	1	1	1	0
After	D7	D6	D5	D4
	1	1	1	0
	D3	D2	D1	D0
	1	0	1	1

Adjusting the BCD Value

Working with four-bit values brings to mind a lot of BCD applications.

Doing arithmetic in BCD can be cumbersome without some help from the microprocessor. The DA instruction provides this help with its ability to readjust the BCD value in the accumulator after performing addition between two BCD numbers.

The instruction (DA) will adjust the result of the addition (now left in the accumulator) into two BCD digits. This is done in the following sequence:

1. Check bits 0 through 3 for a value greater than 9. If the value is not that high, go to step 2. If the contents is greater than 9 or if the auxiliary carry bit (to be covered later) is 1, then increment the accumulator by 6.
2. Check bits 4 through 7 for a value greater than nine. If the value is not that high, then proceed to the next instruction. If the value is greater than 9 or if the carry bit is a 1, then the values in the four upper bits are incremented by 6. If an overflow occurs, the carry bit is set.

Aren't you glad you don't have to do

Address correspondence to Mark J. Robillard, c/o MJR Digital, Inc., PO Box 630, Townsend, MA 01469.

all that in separate programming statements? The DA single-byte instruction does it all. In fact, all the accumulator instructions we just covered are one-byte-only types.

Program Status Word

During our discussions, the carry bit and auxiliary carry flag have come up. I guess it's time to cover the processor's way of checking status when doing arithmetic or logical operations.

The Program Status Word (PSW) should be a relatively familiar entity to those of you with backgrounds in other microprocessors. It is here that the Carry Flag and Auxiliary Carry reside.

Let's look at the structure of the PSW location in the 8748. (Fig. 1 describes the PSW.)

As you can see in Fig. 1, the first three bits act as a sort of pointer to the stack memory area. I mentioned that there are eight levels of subroutine nestings that may be handled by the stack; these locations reside just above the first register back in Data Memory. These three bits indicate which two-byte location is next in line for storing a return address.

To see exactly how this is performed, let's digress a moment into the two areas that use the stack: Call instructions and Interrupts.

Interruption of Instruction Sequence

Commonly used routines or groups of instructions may be written once and used many times through the use of the Call instruction. In larger microprocessors this would equate to a Jump to subroutine.

There are eight versions of the Call instruction:

Call (page 0)	Call (page 4)
Call (page 1)	Call (page 5)
Call (page 2)	Call (page 6)
Call (page 3)	Call (page 7)

Each Call instruction has a unique hex op-code, which allows you to jump to a subroutine located anywhere in program memory as long as you specify the page where the routine begins.

Remember that the 8748 works with 256-byte chunks of memory at a time. The first 1024 locations (pages 0–3) are located on-chip. The other thousand may be accessed as external program memory.

If you select memory bank 1 (SEL MB1 instruction) you get another 2K of external program space. It should be cautioned, however, that the Call instruction and any other page-oriented instruction will function in that relative page regardless of which bank is selected. Page 0 of bank 1 includes locations 2048–2303 of external program memory.

The Call instruction consists of two bytes. The first, of course, is the op-code. One of the eight page-related

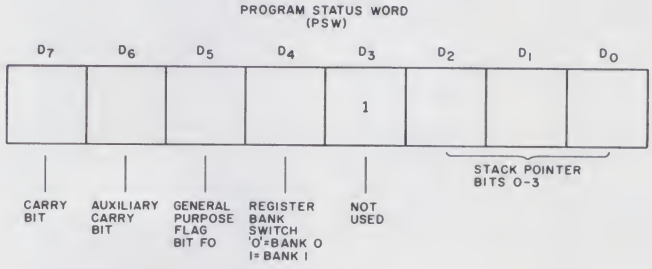
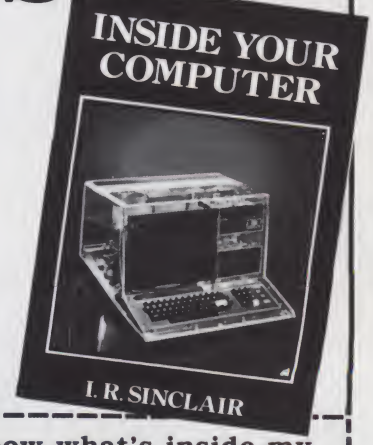


Fig. 1. Bit assignments of the Program Status Word.

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codes is used here.

The second byte is the location of the subroutine (address) within that page. When the processor encounters a Call, the first thing it does is store the present value of the program counter and the upper four bits (carry, aux carry, F0 and bank) on to the stack.

Because it is possible to address up to 4K (internal and external banks 0 and 1) of program memory, there is a need for 12 address bits. (The actual placement of this information on the stack is outlined in Fig. 2.)

After the stack is loaded, the low-order eight bits of the program counter are reloaded from the second byte of the Call instruction. The upper bits (A8, A9, A10) are adjusted according to the bank of the Call, and execution is resumed at that new location. Normal instruction processing continues until a return from subroutine (RET) instruction is encountered.

Either of the two return instructions, RET and RETR, will enable you to retreat to the original calling point, but they don't return you exactly the same way. The RET instruction will decrement the stack pointer (PSW bits 0–3) to point to where you stored the directions for home.

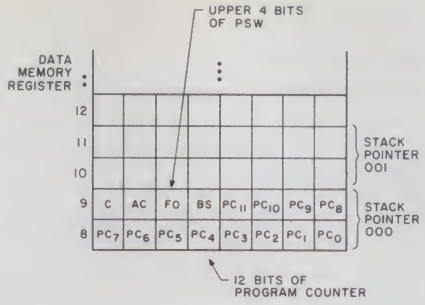


Fig. 2. Details of internal stack operation.

The program counter will then don its previous set of clothes (a-dress?) and resume processing at home. (Notice it left behind the upper four bits of the PSW.) The RET instruction may be used in cases where the status of the PSW bits either are not used or are unimportant to that particular point in the program.

The next Call instruction will clobber those bits that are left, so be sure you don't need to know what their state was when you left.

For those of you who tend to be extra cautious, there is a return that will restore the PSW to its initial state. The RETR instruction resumes processing at home and restores the PSW. Be a little brave and use RET occasionally; the Surgeon General has not determined it to be unhealthy! (On that note, why don't you take a break here? Get up, walk around... this stuff can be pretty dry. I know; I've fallen asleep three times already!)

Well, so far we've seen how the accumulator may be accessed directly. We've investigated the stack and the use of subroutines.

There is another case where 8748 program execution may be interrupted. The INT input pin will cause an immediate interrupt. This is a hardware function that is involved whenever a low level is detected on the INT pin. When it occurs, both the program counter and the upper four PSW bits are saved on the stack.

Hardware inside the processor then loads the address value 003 into the program counter and execution is picked up there. Normally, you would put a jump instruction (JMP) in location 003, which would catapult you into a general-purpose interrupt routine. (We'll cover jumps a little later on.)

After executing the interrupt service routine, you can reenter your program right where you left off by performing the RETR instruction. So keep in mind

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when you're programming to carve out some space around location 003.

In fact, take a look right now at Fig. 3; it shows the layout of the program memory. Indicated in the figure are the reset and interrupt locations. The timer interrupt shown there will be covered later.

There may be times when you might not want to be interrupted. In fact, it's a good idea to avoid interruption while you're processing an interrupt request. The 8748 provides the ability to disable or enable the operation of the INT line through the use of two instructions: EN I and DIS I.

PSW (Continued)

Getting back to where we left off, let's investigate the remainder of the program status word. Bit 4 (D3) is not used, and when it is read, a logic 1 will appear in this place.

The next bit location to the left indicates which register bank is being utilized. When you do either a SEL RB0 or a SEL RB1 instruction, it is this bit that is affected.

D5 is a general-purpose readable and writable flag; it's called F0. In fact, elsewhere within the microcomputer is another flag bit called F1. These flag bits can be used whenever you need someplace to mark the fact that something has occurred.

If your program determines, for instance, that you are in a certain mode (like "transmit" in a radio controller), this bit may be used to mark and store that fact. Any time you need to know what mode you're in, just read the flag bit.

A number of instructions will manipulate or utilize both flags:

```
CLR F0      JF0
CLR F1      JF1
CPL F0
CPL F1
```

The first set (CLR) does just what it implies. The contents of flags 0 and 1 will be zero after each are executed. The next set assumes that the contents will be the exact opposite of what they were previous to the instruction (CPL).

The column on the right is our first encounter with conditional branching. JF0 means that if the contents of F0 is 1, then a jump to a certain address will occur. The value of the place to go is contained in the following byte. You may traverse 256 places, which is one page. As you can see, both flags may be set, cleared and tested. What more could you want?

Bit 6 of the PSW and bit 7 are carry flags. The first one (AC), the auxiliary carry, is active following the DA (decimal adjust) instruction we talked about earlier. When an overflow occurs between BCD digits, this flag goes positive.

The other carry bit is used to indicate that the accumulator has overflowed (going from FF to 00) during the previous instruction. This is helpful when doing addition; it indicates when a carry-over operation must be

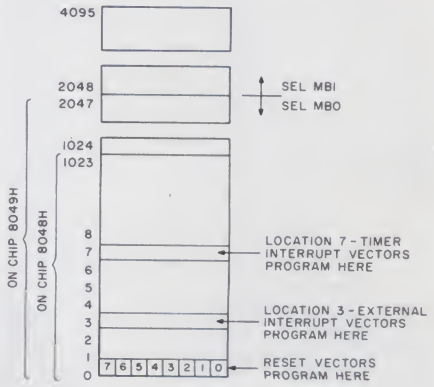


Fig. 3. Map of internal program memory.

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performed.

It's possible at any time to change the entire contents of the PSW simply by moving the data resident in the accumulator directly into it. The MOV PSW,A allows this.

Conversely, the contents of the PSW may be moved into the accumulator by executing a MOV A,PSW instruction.

Arithmetic and Logic Functions

That about does it for the PSW. Those carry flags bring up another group of instructions. The list below describes the range of arithmetic and logic operations that come with the controller.

ADD A,Rr	ORL A,Rr
ADD A,#data	ORL A,#data
ADDC A,Rr	XRL A,Rr
ADDC A,#data	XRL A,#data
ANL A,Rr	
ANL A,#data	

Notice that each operation has two methods of getting the immediate data to operate on the accumulator.

The first, ADD A,Rr, adds the contents of A to the contents of the register specified (0–7); the result is left in the accumulator. The next does the same, except it tests the carry flag to see if the previous operation overflowed.

The 8748 has the capability of performing logical ANDs, ORs and Exclusive ORs on its data. The next three sets illustrate the operations as they exist in the chip. Either the data immediately following or the specified register provides the other operand.

Arithmetic with computers can be performed in a number of ways. It's possible to multiply the contents of a register or accumulator by shifting the bits one position to the left. If you were to write an algorithm to perform this shift using MOVE, AND and OR instructions, it would be relatively complex. The 8748 allows you to perform shifts, either left or right, with the use of one-byte op-codes.

RL A	RR A
RLC A	RRC A

The op-codes above pertain to the shift instructions. The left column will shift the contents of the accumulator one bit to the left. At that time, a zero will be placed into bit 0. The next one will shift left into the carry flag.

Bit 7 will replace the previous information in the flag, which will be placed in bit 0 (a vicious circle). The column on the right will shift everything to the right.

Register Operations

Throughout these discussions, both register banks that are resident on-chip have been briefly mentioned. You have seen bank selection instructions, registers used as immediate data and registers used as address pointers.

One section of instructions is dedicated specifically to these registers. Let's look at them:

MOV A,Rr	INC Rr
MOV Rr,A	DEC Rr
MOV A,#data	INC @R0
MOV Rr,#data	INC @R1
XCH A,Rr	DJNZ Rr, addr

The first two on the left allow you to traffic data between any register and the accumulator. Both of these and the last one in the column move between the two places.

Of course, XCH will change both locations where the MOVs affect only the destination, be it register or accumulator. The MOV A,#data and MOV Rr,#data are two-byte instructions that allow you to set a value into either. The second byte contains the data to be transferred.

The column on the right allows you to add one or subtract one from any register.

By the way, these instructions that specify an Rr are only one byte in length. Each register has its associated op-code. So the INC Rr instruction is really eight separate ones! The same applies for any register-based instruction.

There are many opportunities within the instruction set to catapult yourself to another location.

The INC @R0 and INC @R1 instructions really pertain to manipulating internal data memory and should have been covered earlier. I guess they were inadvertently swept under the rug, even though they're so useful. Any location in data memory pointed to by either R0 or R1 may have its contents incremented.

Last, but certainly not least, is the DJNZ instruction. This operation is worth its weight in gold. With it, you can decrement the contents of a specified register and test to see if it has become zero. If the test proves negative, it will jump you to the address specified in the following byte. (It does all this in one instruction.)

It's useful in counting delays or counting anything, and you'll find that the register array included on-chip also can be helpful.

In many instances, you may not even need to use the data-memory storage area. These registers are important because you can use them not only for data storage but for pointing to other locations during jump operations.

Branches, Jumps And General Leap-Frogging

You have seen, by now, that there are many opportunities within the instruction set to catapult yourself to another location. Typically, this kind of leap-frogging would occur whenever a decision block is encountered.

Within the 8748, a number of specific conditions may be tested, and a jump can be performed as a result. The general JMP instruction has been

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covered, as have the JF0, JF1 and DJNZ commands. The list below outlines the rest of them.

JMPP @A	JT0,addr	JBN,addr
JC,addr	JNT0,addr	JTF,addr
JNC,addr	JT1,addr	
JZ,addr	JNT1,addr	
JNZ,addr	JNI,addr	

Quite a list, isn't it? Let's start with the left column.

The first is a complex table-oriented jump, much like the MOVP,@A instruction. Here, the contents of the program memory location pointed to by the number in the accumulator will replace the low-order eight bits of the program counter. It will jump you anywhere within the current page.

This instruction may come in handy if you are running a machine that is receiving codes from an external terminal. Each incoming code catapults you into specific command handlers at varying places within program memory.



Fig. 4. Method of receiving serial data.

The next four will test the state of the carry flag or test whether the contents of the accumulator is zero and take appropriate action.

Moving into the middle column, we see the opportunity to test the state of the T0 and T1 input pins of the chip. Of course, if you were to use T0 as an input, you couldn't perform the ENT0 CLK instruction. You will find that these input pins may come in handy for receiving serial data or for counting applications.

Another instruction that can be used for serial information is the JNI command. This one will jump to the specified address whenever the interrupt line is low. (Now *that* may be confusing.)

Let me explain. Remember I said that you can disable interrupts? Well, when they're disabled, you can use this line as a general-purpose input line by employing this test instruction. Where does the serial data come in? Let's look at an example of receiving data (Fig. 4).

The initial low-going pulses of the start bit will trigger an interrupt. At this time, your service routine should provide the ability to disable further interrupts and start looking at (polling) the INT line with the JNI instruction.

By using the internal timer, you should be able to count bit times and successfully receive the serial data word. Of course, it would be necessary to know in advance what bit rate the data will be clocking in at.

The value that you set in the timer would be one-bit time. If the INT line remains low for one complete bit time, then the data bit is a zero. Moving through the word, after the eighth bit has been received, you start looking for high-stop bits. When the complete word is finished being processed, simply enable the interrupts to catch another transmission.

The column on the right shows only two more jump instructions. In actuality, the first, JBN, is a general name for eight separate jumps. Each bit of the accumulator may be tested for a logic 1 level using this instruction.

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```
1 '       8748 DEVELOPMENT SYSTEM
2 '
3 '
5 CLEAR 5000
10 CLS:PRINT"ONE MOMENT PLEASE": DIM CODE(1024)
15 FOR X = 0 TO 1023: CODE(X) = 0: NEXT X
20 CLS:PRINT "MCS-48 DEVELOPMENT SYSTEM"
30 OUT=128:IN=144:BUS=49152:VOLTS=247
40 P2=49153:P3=49154:CTL=49155:STATUS=176
50 GOSUB 200
60 PRINT: PRINT "SELECT FROM THE FOLLOWING"
70 PRINT: PRINT "1) PROGRAM 8748"
80 PRINT "2) READ 8748"
90 PRINT "3) EMULATE 8748"
100 INPUT A
110 ON A GOTO 1000, 2000, 3000
120 GOTO 10
200 POKE(CTL),IN
210 POKE(P3),VOLTS
220 POKE(P2),STATUS
230 RETURN
500 HI=0: LO=0: POKE(CTL),OUT
505 L=X
510 IF L=> 512 THEN HI=HI= 2: L = L - 512
520 IF L=> 256 THEN HI=HI OR 1: L = L - 256
530 LO=L: HI=HI OR VOLTS
540 POKE(BUS),LO
550 POKE(P3), HI
560 RETURN
1000 CLS: PRINT "8748 PROGRAMMER"
1005 GOSUB 1010
1007 GOTO 1240
1010 PRINT: PRINT "PROGRAM IS IN:"
1020 PRINT "1) SYSTEM RAM"
1030 PRINT "2) CASSETTE FILE"
1040 PRINT "3) TO BE ENTERED BY KEYBOARD"
1050 INPUT A: IF A > 3 THEN GOTO 1000
1060 IF A = 3 THEN GOTO 1150
1070 IF A = 1 THEN GOTO 1235
1080 IF A = 2 THEN INPUT "FILE NAME =": A$
1090 OPEN "I", -1, A$
1100 FOR X = 0 TO 1023
1110 IF EOF(-1) THEN GOTO 1240
1120 INPUT #-1, CODE(1024)
1130 NEXT X
1140 GOTO 1240
1150 CLS
1160 INPUT "ENTER START ADDRESS": A
1170 INPUT "ENTER END ADDRESS"; B
1180 CLS: FOR X = A TO B
1190 PRINT X;"=";
1195 INPUT C$
1200 IF C$ = " " THEN GOTO 1235
1210 IF C$ = "R" THEN X = X - 1: GOTO 1190
1220 CODE(X) = VAL(C$)
1230 NEXT X
1235 RETURN
1240 PRINT "INSERT 8748 INTO SOCKET"
1250 PRINT"PRESS <ENTER> TO PROGRAM"
1260 INPUT A
1270 CLS:PRINT"PROGRAMMING LOCATION
1280 FOR X = 0 TO 1023
1300 VOLTS = VOLTS AND 251
1310 POKE(P3), VOLTS
1320 VOLTS = VOLTS AND 223
1330 POKE(P3), VOLTS
1340 GOSUB 500
1350 VOLTS = VOLTS OR 8
1360 POKE(P3), VOLTS
1370 POKE(BUS), CODE(X)
1380 VOLTS = VOLTS AND 239
1390 POKE(P3), VOLTS
1400 VOLTS = VOLTS AND 191
1410 POKE(P3), VOLTS
1420 VOLTS = VOLTS OR 64
1430 VOLTS = VOLTS AND 127
1440 POKE(PE), VOLTS
1450 FOR T = 1 TO 5: NEXT T
1460 VOLTS = VOLTS AND 191
1470 VOLTS = VOLTS OR 128
1480 POKE(P3), VOLTS
1490 VOLTS = VOLTS OR 64
1500 POKE(P3), VOLTS
1510 VOLTS = VOLTS OR 16
1520 POKE(P3), VOLTS
1530 POKE(CTL), IN
1540 VOLTS = VOLTS OR 4
1550 POKE(P3), VOLTS
1560 VFY=  PEEK(BUS)
1570 IF VFY <> CODE(X) THEN PRINT "PROBLEM AT LOCATION": X: GOTO 1240
1580 PRINT@21,X:NEXT X
1590 GOSUB 200
1600 PRINT "PROGRAMMING COMPLETE"
1610 PRINT "YOU MAY REMOVE DEVICE"
1620 PRINT "PRESS <ENTER> FO MENU"
1630 INPUT A: GOTO 20
2000 CLS
2010 PRINT "INSERT 8748 INTO SOCKET"
2020 PRINT "PRESS <ENTER> TO READ"
2030 INPUT A
2040 CLS
2045 PRINT"READING LOCATION"
2050 FOR X = 0 TO 1023
2060 VOLTS = VOLTS AND 223
2070 POKE(P3), VOLTS
2080 GOSUB 500
2090 VOLTS = VOLTS OR 8
2100 POKE(P3), VOLTS
2110 POKE(CTL), IN
2120 CODE(X) = PEEK(BUS)
2130 VOLTS = VOLTS AND 247
2140 POKE(P3), VOLTS
2150 PRINT@17,X:NEXT X
2155 GOSUB 200
2157 FOR X = 0 TO 1023
2160 IF C <> 0 THEN GOTO 2170
2162 NEXT X
2165 PRINT "PART IS ERASED"
2168 GOTO 2350
2170 PRINT "READING COMPLETE"
2180 PRINT: PRINT "PRESS <1> FOR MENU"
2190 PRINT "PRESS <2> TO EXAMINE MEMORY"
2200 PRINT "PRESS <3> TO ENTER PROGRAM MODE"
2210 INPUT A
2220 ON A GOTO 20, 2230, 1240
2230 CLS: PRINT "EXAMINE MEMORY"
2240 PRINT: PRINT "ENTER START ADDRESS"
2250 INPUT A: CLS
2260 FOR X = A TO 1023
2270 PRINT X "="; CODE(X)
2280 A$=INKEY$:IF A$="" THEN 2280
2290 IF A$ = " " THEN GOTO 2330
2300 IF A$ = "R" THEN X = X - 1: GOTO 2270
2310 IF A$ = "Q" THEN GOTO 20
2320 CODE(X) = VAL(A$)
2330 NEXT X
2340 PRINT "END OF MEMORY"
2350 PRINT "PRESS <ENTER> FOR MENU"
2360 INPUT A
2370 GOTO 20
3000 CLS
3010 PRINT "8748 EMULATOR"
3020 PRINT "INSERT 8035 INTO SOCKET"
3030 PRINT "PRESS <ENTER> TO BEGIN"
3040 INPUT A
3050 CLS
3055 GOSUB 1010
3059 CLS:PRINT"LOADING EMULATION RAM"
3060 FOR X = 0 TO 1023
3070 GOSUB 500
3080 STATUS = STATUS AND 223
3090 POKE(P2), STATUS
3100 STATUS = STATUS OR 64
3110 POKE(P2), STATUS
3120 STATUS = STATUS AND 191
3130 POKE(P2), STATUS
3140 POKE(BUS), CODE(X)
3150 STATUS = STATUS AND 127
3160 POKE(P2), STATUS
3170 STATUS = STATUS OR 128
3180 POKE(P2), STATUS
3190 STATUS = STATUS OR 32
3200 POKE(P2), STATUS
3210 PRINT@22,X:NEXT X
3220 CLS: PRINT "EMULATOR"
3230 PRINT: PRINT "1) TO BEGIN RUNNING"
3240 PRINT "2) TO STOP"
3250 PRINT "3) TO RETURN TO MENU"
3260 INPUT A
3270 IF A = 1 THEN VOLTS = VOLTS OR 8: POKE(P3), VOLTS: PRINT: PRINT "PROGRAM RU
NNING": GOTO 3230
3280 IF A = 2 THEN VOLTS = VOLTS AND 247: POKE(P3), VOLTS: PRINT: PRINT "PROGRAM
 STOPPED": GOTO 3230
3290 IF A = 3 THEN GOTO 20
3300 GOTO 3220
```

Listing 1. Basic program that operates 8748 development system.

Substituting the numbers 0 through 7 into the n spot will call out the bit you wish to test. This instruction is particularly useful in I/O processing, where you are looking for the state of a certain bit out of a field of eight to change.

The last jump has to do with the internal timer. Up until now, this piece of hardware has not been covered.

Timer

Included within the 8748 is a general-purpose eight-bit counter that may be operated under program control. Counters come in handy when long time delays must be utilized. The processor need only set up the counter value, connect some constant frequency clock to it and go off doing other things while it is busy counting

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the time away.

Think of it as the timer built into some ovens. If you had to sit in front of the oven all day waiting for a roast to cook, you'd get nothing else done.

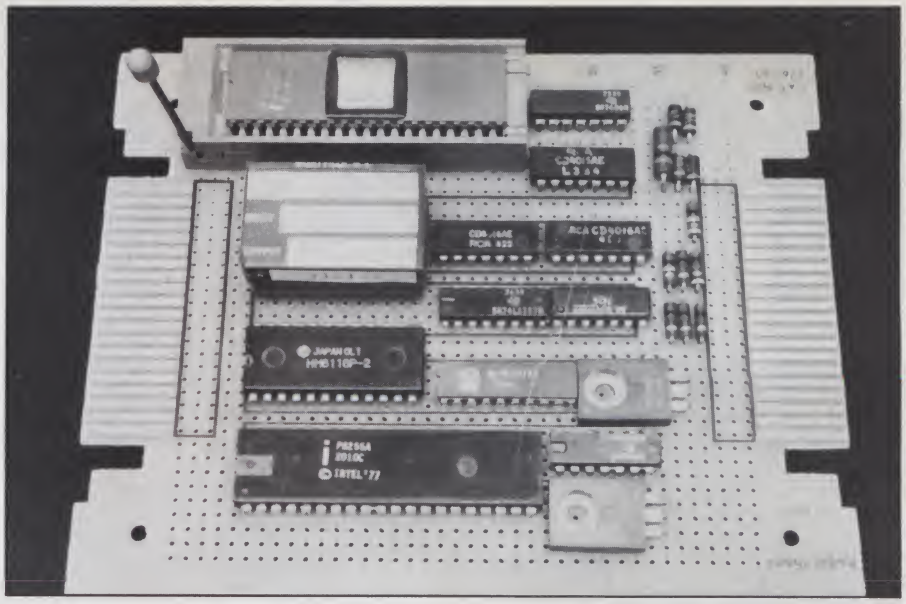
This particular counter only counts up. That is, every clock pulse will increment the value contained in it. When it overflows (FF to 00), there is a flag associated within the hardware that gets set. It is this flag that the JTF instruction tests.

You also have the option of allowing an interrupt to occur upon overflow. When this is enabled, through the use of the EN TCNTI instruction, the program counter will vector you to location 007 in program memory.

The same rules apply to this interrupt as in the general purpose external one. Disabling it is done by performing a DIS TCNTI instruction.

In reality, there are two modes of operation for the counter. The first, and most used, is the timer mode. This is where a known time base clock is applied to increment the value. The time base is derived from the master clock oscillator. (Fig. 5 shows the internal hook-ups of the two modes.)

As you can see, in the timer mode a STRT T instruction will connect the



View of the programmer/emulator board.

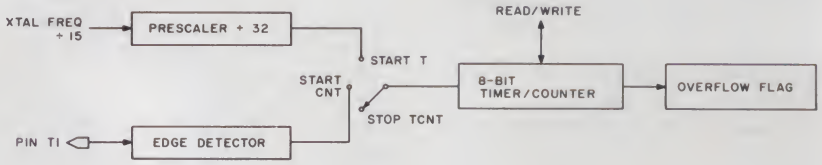


Fig. 5. Internal timer operation.

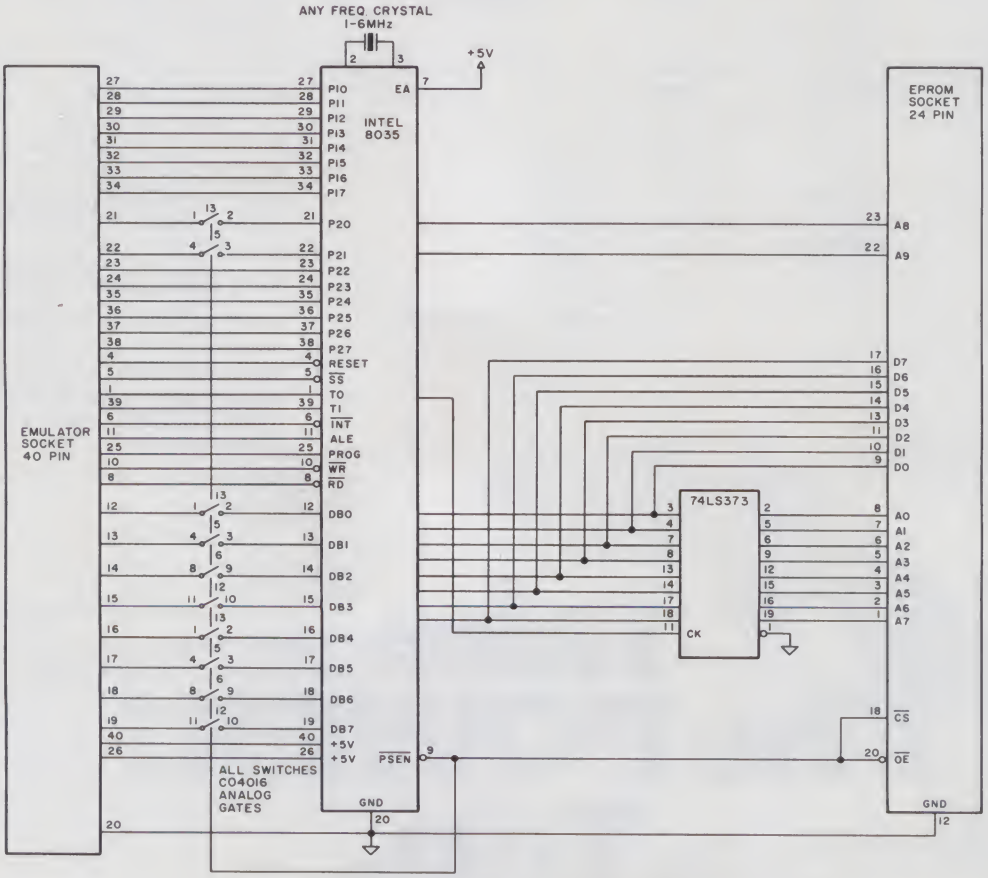


Fig. 6. Schematic of stand-alone 8748 emulator.

counter to the master clock (actually, the crystal frequency divided by 15) through a divide-by-32 prescaler.

Initial values may be entered into the counter through the use of the MOV T,A instruction. Conversely, the contents of the timer may be read at any time through the use of MOV A,T.

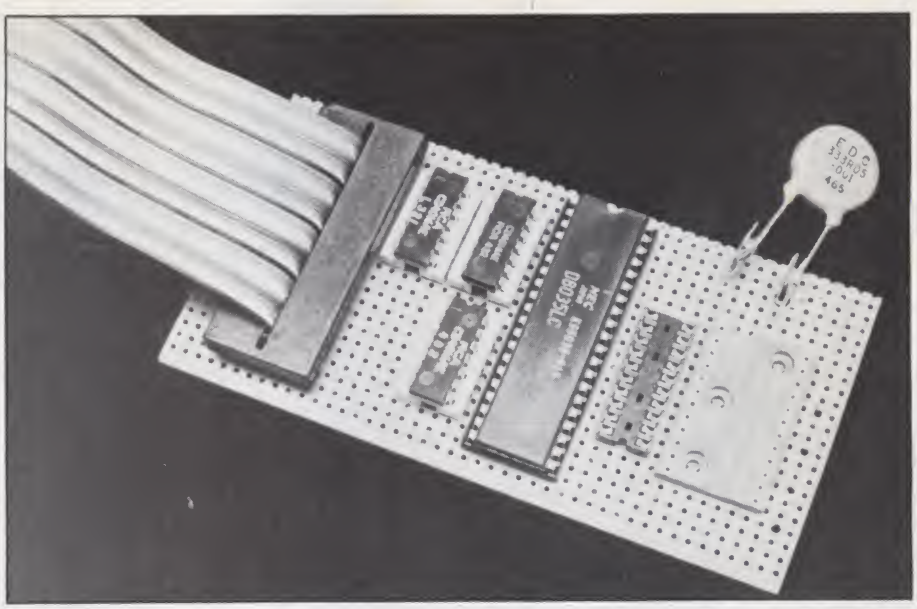
When using the counter mode, the multipurpose T1 input becomes the clock source. This allows you to count events that may happen and interrupt when enough have occurred.

The only other instructions not covered so far deal with I/O. These will be covered quite thoroughly next month, when we'll design and construct the Command Communicator of the Unimem system.

Program Emulation

Emulation is performed through the use of an 8035 part. This basically is an 8748 without the internal ROM. External program memory is connected as it was described previously. (See photos for a picture of the complete programmer/emulator and for a picture of a stand-alone emulator.)

You can insert either an EPROM or another 1K memory part into the program memory socket.



The emulator board.

I have built a 1K ROM emulator that plugs into the socket. With it I can change, via keyboard commands, the data. The programmer/emulator, however, has this programmable feature built in.

At this time, look at Listing 1; this is the Basic program that operates the board. I've tried to add enough remarks so that it's self-documenting.

Throughout the next few months, you'll find yourself getting deeper into the programming and use of the 8748. I hope you've found this series, so far, a useful introduction to small-size intelligence. ■

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MX-100	5.41	4.71	4.09	3.56
Prowriter, PC 8023A-01	2.46	2.14	1.86	1.62
RS DMP 400, LP6, LP8	2.04	1.77	1.54	1.34
RS DMP 200, DMP 500	3.56	3.09	2.69	2.34
RS LP2, LP3, LP5	2.46	2.14	1.86	1.62
Spinwriter (nylon)	2.46	2.14	1.86	1.62

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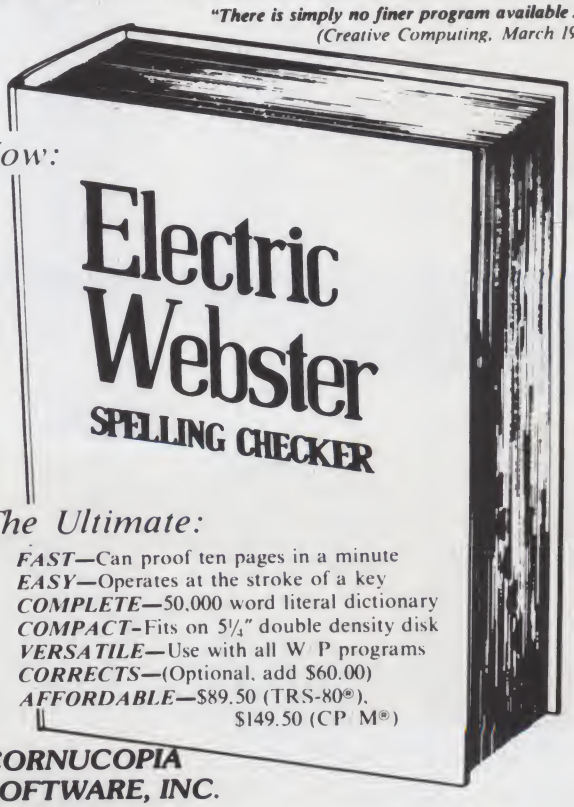
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The Pied Piper: Will Computer Users Follow?

STM Electronics is hoping its new portable computer will take after its namesake and entice people away from competitors. The Pied Piper features 64K, CP/M and a price tag of $1299.

By Kenniston Lord

The Pied Piper, from STM Electronics, has come to town with the hope of leading portable computer users away from the Osborne, Kaypro and similar systems.

The Pied Piper has a price of $1299, making this 64K, Z-80A-based CP/M computer the most powerful available on a dollar-for-dollar basis.

The Pied Piper is a "plain vanilla machine" with one significant advantage over similar systems—disk capacity. A single on-board drive provides more capacity than several machines that have two double-density drives.

The machine's appearance is also plain. It's a functional machine, not a thing of beauty. However, it could be a joy to use, because of extraordinary software bundling (software included in the price of the machine) designed to address the business market from the user's perspective.

The idea of a portable is, of course, to be able to carry the thing. This one is small enough and light enough (12½ pounds) to make that an easy task. Lacking a second drive and a monitor, this computer may be used in a variety of ways not before considered because of the burdensome weight and size of other portables. After all, others have advertised that their portable computers fit under an airplane seat. This one fits in a briefcase—disk device and all.

At first glance, the natural question is whether you'll be able to function without a second drive or monitor. The on-board drive is a 96-tpi (tracks per inch), double-sided, double-density drive that provides nearly 800K of storage (compared to the standard double-density of 320K). It would take considerable time to consume that much space.

For back-up purposes, Pied Piper provides a single-disk copy program for those who must use it while traveling. While a single-copy backup is time-consuming, the system also provides one-disk single-file copy, permitting backup of only the document with which you are working.

STM has omitted a monitor from the system on the premise that a monitor can be a permanent part of any scene in which the system is used. The unit will connect to a standard monitor using a video cable or, using a radio frequency modulator, to a standard television set.

The monitor's character size may be set by software to 40-character or 80-character mode, depending upon the resolution of the monitor used. The characters produced at 40-character size are double-size and a benefit for the sight-impaired. While 40-column display may be designated, 80-character lines are produced, irrespective of the available output space. Displays are shifted using function key/number key combinations.

A two-line-by-80-character LCD is available. The LCD will provide sufficient visual output capability where no television monitor is available, or where using one would be inconvenient. It will suffice until a larger monitor can be connected. Cost of the optional LCD is $525, including modem.

The unit was reviewed using an Amdek 300 green-on-black monitor, and the output was easily readable



A novel portable, the Pied Piper features 64K, a single drive and CP/M, but lacks a monitor.

Address correspondence to Ken Lord, 45 School St., Winchendon, MA 01475.

in both modes.

The unit itself is constructed of molded plastic. There is a dust cover that fits over the keyboard and which must be removed gingerly; to me this is the most vulnerable part of the unit. Because of the popular if-all-else-fails-read-the-directions philosophy, this cover is certain to be broken early, leading to frustration and additional impact exposure to the keyboard. It has been suggested that STM advise the purchaser to read the directions carefully before opening the package. How large this problem will be—if indeed it is a problem at all—cannot be known.

The system is bundled with $1700 worth of Perfect software: Perfect Writer, Perfect Speller, Perfect Filer and Perfect Calc. Also, the CP/M operating system and an assortment of Pied Piper utilities are a part of the bundle.

STM has devised a *user's* machine, not a programmer's machine. But they do not keep you from programming the machine if you wish to do so. A Basic compiler and an assembler are available for a reasonable price. This, at least, will make some contract programming possible, if required.

The list of software options now includes Basic, Pascal, Fortran, dBase II, SuperCalc, WordStar and family, Money Maestro, CP+, and Financial Planning Language, all of which are separately priced. These packages, and more, are certain to be available through the Pied Piper dealer network.

The bundled software packages will be sufficient for most purchasers. The availability of other software may create a market different from what the manufacturer expected. Since the price of this unit makes it a likely candidate for placement into word processing environments, it is conceivable that Pied Pipers may populate the typing pools.

The machine is a standard 8-bit CP/M package, and was not designed to be unique. Its on-board disk (assigned to Drive A) can handle the majority of applications. It is a double-sided, double-density Mitsubishi drive capable of 800K. The unit has three jewels above the keyboard to indicate status: a power light (green if on), an activity light (red if on) for the on-board drive (A), and one for an optional second drive (B). The drive light stays lit constantly. This should be changed, as this light is customarily used to indicate that the drive has been selected.

Interfacing connections for a second disk drive or a hard disk is done through a backplate mounted on the unit. All connections may be disconnected easily to facilitate portability. The Pied Piper's power supply is sufficient to support two disk drives, but the hard disk's power supply will be contained within that unit.

The keyboard is qwerty, with a few other standard computer keys—control, escape, delete, function, and so on. The function key works in combination with the other keys, giving 36 programmable keys. CP/M reacted to the control key, as expected. The cursor keys are assigned by a utility relative to the software package being used. The backspace key is a destructive backspace (it removes characters). Users may be surprised to find the British pound money symbol on the keyboard.

STM's literature advises that repair services may be obtained at Xerox Service Centers. Beyond a standard 90-day warranty, a one-year service contract is available for service (from Xerox) for $199. The dealer network is being established while this article is being written. It is anticipated that the dealer network will assume some software and hardware support services.

STM's documentation package is well-done, one of the better efforts I've seen. It presents system information and CP/M instruction clearly and concisely. The documentation that accompanies the Perfect software is among the best I've seen—made even better by the computer-assisted instruction used to teach it. While this level of documentation is to be applauded for the novice user, it isn't enough. STM advises that another, more technical, level of documentation will be provided. Xerox will be producing service literature.

My early impressions of this unit were extremely negative. It is difficult to evaluate a unit when it has been damaged. Pied Piper arrived damaged. The on-board disk drive simply wouldn't behave as it should. The data received was insufficient for technical reference. Concerns about little things suddenly became large.

Not wishing to operate in a vacuum, I gave STM the opportunity to rectify the situation. They were also concerned that it would not be possible to give the unit a fair assessment if it hadn't arrived intact. Since the vagaries of shipping affect us all, STM's marketing director, Mr. Derek Southern, put forth an extraordinary effort, flying across the country bearing a workable device and amply demonstrating what has proved to be an extremely capable computer. While that level of support cannot be performed for every customer, it is, at least, indicative of the fact that this company cares that its product begin its life correctly. This perspective is maintained by the availability of an 800 number you can call for help.

The price is right, to be certain, and Pied Piper is destined to prove that a micro need not be expensive to be good. Available support is a critical factor, as well, and Pied Piper has that covered. STM has provided a 24-hour help line to locate the nearest sales/service outlet. The number is 800-772-3545, ext. 576 (CA) and 800-227-1617, ext. 576 (elsewhere). Upon purchase, you will also be given another toll-free number where you may obtain technical and/or software assistance.

Pied Piper will make a substantial dent in the portable computer market, given that it aggressively pursues that market. STM has provided the foundation of a *line of user-oriented tools* with a different perspective. If they are as ambitious with their marketing activities as they appear to be, others are certain to follow.■

A Capsule Look At the Pied Piper

Manufacturer
STM Electronics Corp., 525 Middle Field Road, Suite 130, Menlo Park, CA 94025.
List Price
$1299.
Standard Features
Z-80A microprocessor; 64K RAM; 4K ROM; 2K of video display buffer; 2K of ROM for character generation; full-size typewriter-style ASCII keyboard; Centronics-type parallel printer port; 24 lines of 80 characters for video monitor; 24 lines of 40 characters for TV display; upper/lowercase characters with special graphics characters; 5¼-inch slimline disk drive with one megabyte of unformatted storage, 800K formatted; CP/M operating system.
Proportions
4×20.2×10.8; weighs less than 13 pounds.
Options
RS-232C serial port with one software programmable baud rate up to 19.2K; two-line by 80-column LCD; modem.
Software
Perfect Writer; Perfect Speller; Perfect Calc; Perfect Filer.
Optional Software
SuperCalc; MBasic; dBase II; WordStar; Multiplan.

CONVERSIONS

Each month Microcomputing will publish translations of selected programs published in the magazine. We encourage our readers to submit a hard copy of their conversions along with a cassette or disk of the program. Include a self-addressed, stamped envelope for the return of magnetic media if not selected for publication. Authors whose translations are chosen will receive payment for their efforts.

Check-writing program modified to run on the Heath computer systems. By Sam Kauffman, Route #6, Box 57, Ozark, AL 36360.

```
00010 REM ************************************************************************
00020 REM *                                                                      *
00030 REM *      THIS PROGRAM CONVERTS NUMBERS TO ENGLISH WORDS                  *
00040 REM *                                                                      *
00050 REM *      WRITTEN BY     VAN WOLVERTON                                    *
00060 REM *                                                                      *
00070 REM *      MODIFIED FOR HEATH HDOS/B.H. BASIC BY S. KAUFFMAN               *
00080 REM *                                                                      *
00090 REM ************************************************************************
00095 REM
00100 PRINT CHR$(27)+"E" :REM CLEAR SCREEN AND HOME CURSOR
00110 GOSUB 500 :REM INITIALIZE STRINGS
00120 A$="":LINE INPUT "Amount of check:  ";A$
00130 GOSUB 1000 :REM CONVERT TO WORDS
00140 PRINT C1$
00150 PRINT
00160 IF A$<>"" THEN 120
00170 END
00495 REM
00500 REM ************************************************************************
00510 REM *      INITIALIZE WORD ARRAYS                                          *
00520 REM ************************************************************************
00525 REM
00530 DIM U$(19),T$(9),M$(5)
00540 Z1$="0" : Z2$="00" : S$="  " : P$="."
00550 FOR I=1 TO 19
00560 READ U$(I)
00570 NEXT I
00580 FOR I=2 TO 9
00590 READ T$(I)
00600 NEXT I
00610 FOR I=2 TO 5
00620 READ M$(I)
00630 NEXT I
00640 DATA "one","two","three","four","five","six","seven","eight","nine"
00650 DATA "ten","eleven","twelve","thirteen","fourteen","fifteen"
00660 DATA "sixteen","seventeen","eighteen","nineteen"
00670 DATA "twenty","thirty","forty","fifty","sixty","seventy","eighty"
00680 DATA "ninety"
00690 DATA "thousand","million","billion","trillion"
00700 RETURN
00995 REM
01000 REM ************************************************************************
01010 REM *      INITIALIZE STRINGS AND VERIFY INPUT                             *
01020 REM ************************************************************************
01025 REM
01030 C$="" : C1$="" : D$=""
01040 IF VAL(A$)<.01 THEN C1$="*** VOID ***" : RETURN
01995 REM
02000 REM ************************************************************************
02010 REM *      SEPERATE INTO DOLLAR AND CENT STRINGS                           *
02020 REM ************************************************************************
02025 REM
02030 M=MATCH(A$,P$,1)
02040 IF M=0 THEN D$=A$
02050 IF M>0 THEN D$=LEFT$(A$,M-1):C$=MID$(A$,M+1,2)
02060 IF VAL(C$)=0 THEN C$="" : A$=D$
02995 REM
03000 REM ************************************************************************
03010 REM *      CONDITION INPUT DATA                                            *
03020 REM ************************************************************************
03025 REM
03030 IF LEN(C$)=1 THEN C$=C$+"0"
03040 L=LEN(D$)/3
03050 L=L-INT(L)
03060 IF L>.5 THEN D$=Z1$+D$
03070 IF L<.5 AND L<>0 THEN D$=Z2$+D$
03080 IF D$="" THEN D$="000"
03090 L1=1
03995 REM
04000 REM ************************************************************************
04010 REM *      CONVERT DOLLAR STRING TO WORDS                                  *
04020 REM ************************************************************************
04025 REM
04030 FOR I=LEN(D$)/3 TO 1 STEP -1
04040 D1$=MID$(D$,L1,3) : L1=L1+3
04050 D1=VAL(LEFT$(D1$,1))
04060 D2=VAL(MID$(D1$,2,1))
04070 D3=VAL(RIGHT$(D1$,1))
04080 IF D1>0 THEN C1$=C1$+U$(D1)+" hundred "
04090 IF D2=0 THEN C1$=C1$+U$(D3)+" "
04100 IF D2=1 THEN C1$=C1$+U$(D2*10+D3)+" "
04110 IF D2>1 THEN C1$=C1$+T$(D2) : IF D3>0 THEN C1$=C1$+"-"+U$(D3)
04120 IF D2>1 AND D3>0 THEN C1$=C1$+" "
04130 IF I>1 THEN IF D1+D2+D3>0 THEN C1$=C1$+M$(I)+" "
04140 NEXT I
04995 REM
05000 REM ************************************************************************
05010 REM *      ADD CENTS AND CLEAN UP                                          *
05020 REM ************************************************************************
05025 REM
05030 IF LEN(C1$)=1 THEN C1$="nONE "
05040 IF C$="" THEN C1$="eXACTLY "+C1$ : IF VAL(A$)=1 THEN C1$=C1$+"dollar"
05050 IF VAL(C$)=0 AND VAL(A$)>1 THEN C1$=C1$+" dollars"
05060 IF C$<>"" THEN C1$=C1$+"and "+C$+"/100 dollars"
05070 T=ASC(C1$) : C1$=CHR$(T AND 95)+RIGHT$(C1$,LEN(C1$)-1)
05080 L=LEN(C1$)
05090 M=MATCH(C1$,S$,1):IF M>0 THEN C1$=LEFT$(C1$,M-1)+RIGHT$(C1$,L-M):GOTO 5080
05100 RETURN
```

Program conversion of "Apple Gets Optimal" program published in the April 1983 Microcomputing. *Modified for the Heath H89 by Robert Anderson, 2608 Winter Street, St. Albans, WV 25177.*

```
10 '************* LINEAR PROGRAMMING BY MARGARET MORRIS ************************
20 '----MICROCOMPUTING, APRIL 1983, P60 ;MODIFIED BY R. L. ANDERSON
30 '** SAVED AS 'B:MINMAX.BAS'
40 PRINT CHR$(27)+"E";CLEAR '***BLANK SCREEN AND ZERO ALL VARIABLES
50 '-- INITIALIZE VARIABLES OPT$, VAR, CNS
60 INPUT "MAXIMIZE OR MINIMIZE? (MAX/MIN): ";OPT$
70 IF OPT$="MAX" OR OPT$="MIN" THEN 100
80 GOSUB 250 '*** INVALID INPUT ALARM
90 GOTO 60
100 PRINT:PRINT:PRINT
110 INPUT "HOW MANY VARIABLES? ";VAR
120 PRINT:PRINT:PRINT
130 INPUT "HOW MANY CONSTRAINTS? ";CNS
140 DIM MTRX(CNS+2,VAR+CNS+2)
150 GOSUB 310 '***BUILD SIMPLEX TABLEAU
160 GOSUB 1130 '***FIND OPTIMUM SOLUTION
170 IF SOLN=1 THEN GOSUB 1650 '***PRINT SOLUNTION IF FOUND
180 PRINT:PRINT:PRINT
190 INPUT "MORE PROBLEMS? (Y/N): ";MRE$
200 IF MRE$="Y" THEN 40
210 IF MRE$="N" THEN 240
220 GOSUB 250 '***INVALID INPUT ALARM
230 GOTO 190
240 END '***END OF MAIN PROGRAM
250 '***** ALARM FOR INVALID INPUT SUBROUTINE
260 FOR NOISE=1 TO 100
270 PRINT CHR$(7)
280 NEXT NOISE
290 PRINT CHR$(27)+"E";PRINT;PRINT;PRINT "INPUT ONE OF THE CHOICES IN PARENTHESE
S"
300 PRINT:PRINT:RETURN
310 '***** BUILD SIMPLEX SUBROUTINE
320 GOSUB 410 '*** ADD VARIABLE LABELS
330 GOSUB 490 '*** ADD ID MATRIX
340 GOSUB 570 '*** ENTER VALUES FOR COEFFICIENTS
350 GOSUB 820 '*** DISPLAY VALUES, ALLOW CHANGES
360 IF OPT$="MAX" THEN 400
370 FOR COL=0 TO CNS+VAR
380 MTRX(CNS,COL)=MTRX(CNS,COL)* -1
390 NEXT COL
400 RETURN
410 '*** ADD VARIABLE LABELS
420 FOR ROW=0 TO CNS-1
430 MTRX(ROW,VAR+CNS+1)=ROW+VAR+1
440 NEXT ROW
450 FOR COL=0 TO VAR+CNS-1
460 MTRX(CNS+1,COL)=COL+1
470 NEXT COL
480 RETURN
490 '*** IDENTITY MATRIX
500 FOR ROW=0 TO CNS
510 FOR COL=VAR TO CNS-1+VAR
520 MTRX(ROW,COL)=0
530 NEXT COL
540 MTRX(ROW,ROW+VAR)=1
550 NEXT ROW
560 RETURN
570 '*** ENTER CONSTANTS, COEFFICIENTS
580 PRINT CHR$(27)+"E";PRINT:PRINT
590 PRINT:PRINT "ENTER THE COEFFICIENT OF EACH VARIABLE";PRINT
600 FOR ROW=0 TO CNS-1
610 PRINT "CONSTRAINT ";ROW+1
620 FOR COL=0 TO VAR-1
630 PRINT "VARIABLE ";COL+1
640 INPUT MTRX(ROW,COL)
650 NEXT COL
660 PRINT "CONSTANT ";ROW+1
670 INPUT MTRX(ROW,CNS+VAR)
680 PRINT:PRINT:PRINT
690 INPUT "ANY CHANGES? (Y/N) ";CHG$
700 IF CHG$="Y" THEN 610
710 IF CHG$="N" THEN 740
720 GOSUB 250 '***INVALID INPUT ALARM
730 GOTO 690
740 PRINT CHR$(27)+"E";NEXT ROW
750 PRINT "OBJECTIVE ROW VALUES "
760 FOR COL=0 TO VAR-1
770 PRINT "VARIABLE ";COL+1
780 INPUT MTRX(CNS,COL)
790 NEXT COL
800 INPUT "VALUE OF OBJECTIVE CONSTANT ";MTRX(CNS,VAR+CNS)
810 RETURN
820 '*** DISPLAY VALUES AND ALLOW CHANGES
830 PRINT CHR$(27)+"E":PRINT:PRINT
840 PRINT TAB(10);
850 FOR I%=1 TO VAR
860 PRINT "VAR";I%;SPACE$(6);
870 NEXT I%
880 PRINT "CONSTANT"
890 FOR ROW=0 TO CNS
900 IF ROW=CNS THEN PRINT "OBJ ";TAB(7);:GOTO 920
910 PRINT "CNS";ROW+1;TAB(7);
920 FOR COL=0 TO VAR-1
930 PRINT USING "##.####^^^^";MTRX(ROW,COL);:PRINT " ";
940 NEXT COL
950 PRINT USING "##.####^^^^";MTRX(ROW,CNS+VAR)
960 NEXT ROW
970 PRINT:PRINT:PRINT
980 INPUT "ANY CHANGES? (Y/N) ";CHG$
990 IF CHG$="Y" OR CHG$="N" THEN 1020
1000 GOSUB 250 '*** INVALID INPUT ALARM
1010 GOTO 980
1020 IF CHG$="N" THEN 1120
1030 PRINT "TYPE ROW NUMBER, THEN COLUMN NUMBER, OF ENTRY TO BE CHANGED"
1040 PRINT "ROW NUMBER (1 TO";CNS;"): ";:INPUT ROW
1050 IF ROW=0 OR ROW>CNS THEN GOSUB 250:GOTO 1040  '***INVALID INPUT ALARM
1060 PRINT "COLUMN NUMBER (1 TO";VAR;"): ";:INPUT COL
1070 IF COL=0 OR COL>VAR THEN GOSUB 250:GOTO 1060 '***INVALID INPUT ALARM
1080 INPUT "NEW VALUE ";NV
1090 IF VAR<COL THEN COL=COL+CNS
1100 MTRX(ROW-1,COL-1)=NV
1110 PRINT CHR$(27)+"E";GOTO 890
1120 RETURN
1130 '***** SIMPLEX METHOD TO FIND SOLUTION
1140 SOLN=0:FEAS=0 '***INIT FLAGS - NO FEASIBLE SOLUTION YET
1150 OP=0 '*** NO OPTIMUM SOLUTION YET
1160 '*** FIND SMALLEST NUMBER IN OBJECTIVE ROW
```

More

Listing continued.

```
1170 SM=MTRX(CNS,0):PCOL=0
1180 FOR COL=1 TO VAR+CNS-1
1190 IF MTRX(CNS,COL)>SM THEN 1210
1200 SM=MTRX(CNS,COL):PCOL=COL
1210 NEXT COL
1220 IF SM>=0 THEN OP=1:GOTO 1360
1230 '** FIND SMALLEST RATIO
1240 FD=0 '**FLAG TO INDICATE IF VALID RATIO FOUND
1250 VLD=0 '**VALUE OF CURRENT VALID RATIO
1260 SAV=0 '**SAVE VALUE OF SMALLEST RATIO
1270 FOR ROW=0 TO CNS-1
1280 IF MTRX(ROW,PCOL)<=0 THEN 1320 '**INVALID
1290 VLD=MTRX(ROW,CNS+VAR)/MTRX(ROW,PCOL)
1300 IF VLD>SAV AND FD<>0 THEN 1320
1310 SAV=VLD:PROW=ROW:FD=1
1320 NEXT ROW
1330 IF FD=0 THEN OP=0:GOTO 1360
1340 GOSUB 1800 '***ELEMENTARY ROW OPERATIONS
1350 GOTO 1140 '***REPEAT SIMPLEX PROCESS
1360 GOSUB 1420 '***ASSURE FEASIBILITY
1370 IF FEAS=1 AND OP=1 THEN SOLN=1:GOTO 1410
1380 IF CHG=1 THEN GOTO 1140 '**DUAL SIMPLEX USED
1390 IF FEAS=0 THEN PRINT:PRINT "      NO FEASIBLE SOLUTION"
1400 IF FEAS=1 AND OP=0 THEN PRINT:PRINT "INFINITE NUMBER OF SOLUTIONS"
1410 RETURN
1420 '***** DUAL SIMPLEX-ASSURE FEASIBILITY
1430 '**FIND SMALLEST # IN BASIS COL
1440 PROW=0:CHG=0
1450 SM=MTRX(0,VAR+CNS)
1460 FOR ROW=1 TO CNS-1
1470 IF MTRX(ROW,VAR+CNS)>SM THEN 1490
1480 SM=MTRX(ROW,VAR+CNS):PROW=ROW
1490 NEXT ROW
1500 IF SM>0 THEN FEAS=1:GOTO 1640 '**SOLUTION IS FEASIBLE
1510 SAV=0 '***VALUE OF SMALLEST RATIO
1520 FD=0 '*** NO VALID RATIO YET
1530 CHG=0 '**DUAL SIMPLEX NOT USED YET
1540 VLD=0 '***VALUE OF VALID RATIO
1550 FOR COL=0 TO VAR+CNS-1
1560 IF MTRX(PROW,COL)>=0 THEN 1600
1570 VLD=MTRX(CNS,COL)/MTRX(PROW,COL)
1580 IF VLD<SAV AND FD<>0 THEN 1600
1590 SAV=VLD:PCOL=COL:FD=1
1600 NEXT COL
1610 IF FD=0 THEN 1640 '*** NO FEASIBLE SOLUTION
1620 CHG=1 '**DUAL SIMPLEX USED
1630 GOSUB 1800 '***ELEMENTARY ROW OPERATION
1640 RETURN
1650 '***** DISPLAY OF RESULTS SUBROUTINE
1660 PRINT CHR$(27)+"E"
1670 PRINT:PRINT:PRINT "        OPTIMUM VALUES"
1680 FOR ROW=0 TO CNS-1
1690 IF VAR>=MTRX(ROW,CNS+VAR+1) THEN 1730
1700 MTRX(ROW,VAR+CNS+1)=MTRX(ROW,VAR+CNS+1)-VAR
1710 PRINT:PRINT "SLACK VARIABLE FOR CONSTRAINT # ";MTRX(ROW,VAR+CNS+1);" IS ";M
TRX(ROW,VAR+CNS)
1720 GOTO 1740
1730 PRINT:PRINT "VARIABLE ";MTRX(ROW,VAR+CNS+1);" IS ";MTRX(ROW,VAR+CNS)
1740 NEXT ROW
1750 PRINT:PRINT "ALL OTHER VARIABLES & SLACK VARIABLES"
1760 PRINT "  ARE EQUAL TO ZERO"
1770 IF OPT$="MIN" THEN MTRX(CNS,VAR+CNS)=MTRX(CNS,VAR+CNS)* -1
1780 PRINT:PRINT "OPTIMUM SOLUTION= ";MTRX(CNS,VAR+CNS)
1790 RETURN
1800 '***** ELEMENTARY ROW OPERATIONS
1810 MTRX(PROW,VAR+CNS+1)=MTRX(CNS+1,PCOL)
1820 PIVOT=MTRX(PROW,PCOL)
1830 FOR COL=0 TO VAR+CNS
1840 MTRX(PROW,COL)=MTRX(PROW,COL)/PIVOT
1850 NEXT COL
1860 FOR ROW=0 TO CNS
1870 IF ROW=PROW THEN 1920
1880 NEG=MTRX(ROW,PCOL)* -1
1890 FOR COL=0 TO VAR+CNS
1900 MTRX(ROW,COL)=MTRX(ROW,COL)+NEG*MTRX(PROW,COL)
1910 NEXT COL
1920 NEXT ROW
1930 RETURN
```


Circle 34 on Reader Service card.

PConnection

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2102L-4	1024 x 1	(450ns) (LP)	.99
2102L-2	1024 x 1	(250ns) (LP)	1.49
2111	256 x 4	(450ns)	2.49
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2114L-3	1024 x 4	(300ns) (LP)	8/13.45
2114L-2	1024 x 4	(200ns) (LP)	8/13.95
2147	4096 x 1	(55ns)	4.95
TMS4044-4	4096 x 1	(450ns)	3.49
TMS4044-3	4096 x 1	(300ns)	3.99
TMS4044-2	4096 x 1	(200ns)	4.49
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TMM2018-150	2048 x 8	(150ns)	4.95
TMM2018-100	2048 x 8	(100ns)	6.15
HM8118-4	2048 x 8	(200ns) (cmos)	4.75
HM8118-3	2048 x 8	(150ns) (cmos)	4.95
HM8118-2	2048 x 8	(120ns) (cmos)	8.95
HM8118LP-4	2048 x 8	(200ns) (cmos)(LP)	5.95
HM8118LP-3	2048 x 6	(150ns) (cmos)(LP)	8.95
HM8118LP-2	2048 x 8	(120ns) (cmos)(LP)	10.95
Z-8132	4098 x 8	(300ns) (Qstat)	34.95

LP = Low Power Qstat = Quasi-Static

DYNAMIC RAMS

TMS4027	4096 x 1	(250ns)	1.99
UPD411	4096 x 1	(300ns)	3.00
MM5280	4096 x 1	(300ns)	3.00
MK4108	8192 x 1	(200ns)	1.95
MM5298	8192 x 1	(250ns)	1.85
4118-300	16384 x 1	(300ns)	8/11.75
4118-250	16384 x 1	(250ns)	8/11.95
4116-200	18384 x 1	(200ns)	8/12.95
4116-150	16384 x 1	(150ns)	8/14.95
4118-120	18384 x 1	(120ns)	8/29.95
2118	16384 x 1	(150ns) (5v)	4.95
4184-200	65536 x 1	(200ns) (5v)	5.95
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5V = single 5 volt supply

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1702	256 x 8	(1us)	4.50
2708	1024 x 8	(450ns)	3.95
2758	1024 x 8	(450ns) (5v)	5.95
2716	2048 x 8	(450ns) (5v)	3.95
2716-1	2048 x 8	(350ns) (5v)	5.95
TMS2516	2048 x 8	(450ns) (5v)	5.50
TMS2716	2048 x 8	(450ns)	7.95
TMS2532	4096 x 8	(450ns) (5v)	5.95
2732	4096 x 8	(450ns) (5v)	4.95
2732-250	4096 x 8	(250ns) (5v)	8.95
2732-200	4096 x 8	(200ns) (5v)	11.95
2764	8192 x 8	(450ns) (5v)	9.95
2764-250	8192 x 8	(250ns) (5v)	14.95
2764-200	8192 x 8	(200ns) (5v)	24.95
TMS2564	8192 x 8	(450ns) (5v)	17.95
MC68764	8192 x 8	(450ns) (5v)(24 pin)	39.95

5v = Single 5 Volt Supply

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PE-14T	X	6	5,200	119.00
PE-24T	X	9	6,700	175.00
PL-265T	X	20	6,700	255.00
PR-125T	X	16	15,000	349.00
PR-320	X	32	15,000	595.00

Z-80

2.5 Mhz

Z80-CPU	3.95
Z80-CTC	4.49
Z80-DART	10.95
Z80-DMA	14.95
Z80-PIO	4.49
Z80-SIO/0	18.95
Z80-SIO/1	18.95
Z80-SIO/2	18.95
Z80-SIO/9	16.95

4.0 Mhz

Z80A-CPU	4.95
Z80A-CTC	4.95
Z80A-DART	11.95
Z80A-DMA	18.95
Z80A-PIO	4.95
Z80A-SIO/0	16.95
Z80A-SIO/1	18.95
Z80A-SIO/2	16.95
Z80A-SIO/9	18.95

6.0 Mhz

Z80B-CPU	11.95
Z80B-CTC	13.95
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ZILOG

Z6132	34.95
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1.0 mhz	4.95
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3.579535	3.95
4.0	3.95
5.0	3.95
5.0688	3.95
5.185	3.95
5.7143	3.95
6.0	3.95
8.144	3.95
8.5538	3.95
8.0	3.95
10.0	3.95
10.738635	3.95
14.31818	3.95
15.0	3.95
18.0	3.95
17.430	3.95
18.0	3.95
18.432	3.95
20.0	3.95
22.1184	3.95
32.0	3.95

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8085	5.95
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8088	29.95
8087	CALL
8088	39.95
8089	89.95
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8155-2	7.95
8156	6.95
8185	29.95
8185-2	39.95
8741	39.95
8748	24.95
8755	24.95

8200

8202	24.95
8203	39.95
8205	3.50
8212	1.80
8214	3.85
8218	1.75
8224	2.25
8226	1.80
8228	3.49
8231	call
8237	19.95
8237-5	21.95
8238	4.49
8243	4.45
8250	10.95
8251	4.49
8253	6.95
8253-5	7.95
8255	4.49
8255-5	5.25
8257	7.95
8257-5	8.95
8259	6.90
8259-5	7.50
8271	39.95
8272	39.95
8275	29.95
8279	8.95
8279-5	10.00
8282	6.50
8283	6.50
8284	5.50
8286	6.50
8287	6.50
8288	25.00
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1791	24.95
1793	26.95
1795	49.95
1797	49.95
2791	54.95
2793	54.95
2795	59.95
2797	59.95
6843	34.95
8272	39.95
UPD765	39.95
1691	17.95
2143	18.95

CONNECTORS

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RS232 HOOD	1.25
S-100 ST	3.95

6800

68000	59.95
6800	3.95
6802	7.95
6808	13.90
6809E	19.95
6809	11.95
6810	2.95
6820	4.35
6821	3.25
6828	14.95
6840	12.95
6843	34.95
6844	25.95
6845	14.95
6847	11.95
6850	3.25
6852	5.75
6860	9.95
6882	11.95
6875	6.95
6880	2.25
6883	22.95
68047	24.95
68488	19.95

6800 = 1MHZ

68B00	10.95
68B02	22.25
68B09E	29.95
68B09	29.95
68B10	6.95
68B21	8.95
68B45	19.95
68B50	5.95

68B00 = 2 MHZ

6500

1 MHZ

6502	4.95
6504	6.95
6505	8.95
6507	9.95
6520	4.35
6522	7.95
6532	9.95
6545	22.50
6551	11.85

2 MHZ

6502A	6.95
6522A	9.95
6532A	11.95
6545A	27.95
6551A	11.95

3 MHZ

6502B	14.95

UARTS

AY3-1014	8.95
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FUNCTION

MC4024	3.95
LM566	1.49
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8038	3.95

74LS00

74LS00	.24	74LS173	.6
74LS01	.25	74LS174	.5
74LS02	.25	74LS175	.5
74LS03	.25	74LS181	2.1
74LS04	.24	74LS189	8.9
74LS05	.25	74LS190	.8
74LS08	.28	74LS191	.8
74LS09	.29	74LS192	.7
74LS10	.25	74LS193	.7
74LS11	.35	74LS194	.6
74LS12	.35	74LS195	.6
74LS13	.45	74LS198	.7
74LS14	.59	74LS197	.7
74LS15	.35	74LS221	.6
74LS20	.25	74LS240	.9
74LS21	.29	74LS241	.9
74LS22	.25	74LS242	.9
74LS28	.29	74LS243	.9
74LS27	.29	74LS244	.9
74LS28	.35	74LS245	1.4
74LS30	.25	74LS247	.7
74LS32	.29	74LS248	.9
74LS33	.55	74LS249	.9
74LS37	.35	74LS251	.5
74LS38	.35	74LS253	.5
74LS40	.25	74LS257	.5
74LS42	.49	74LS258	.5
74LS47	.75	74LS259	2.7
74LS48	.75	74LS260	.5
74LS49	.75	74LS268	.5
74LS51	.25	74LS273	1.4
74LS54	.29	74LS275	3.3
74LS55	.29	74LS279	.4
74LS63	1.25	74LS280	1.9
74LS73	.39	74LS283	.6
74LS74	.35	74LS290	.8
74LS75	.39	74LS293	.8
74LS76	.39	74LS295	.9
74LS78	.49	74LS298	.8
74LS83	.60	74LS299	1.7
74LS85	.69	74LS323	3.5
74LS86	.39	74LS324	1.7
74LS90	.55	74LS352	1.2
74LS91	.89	74LS353	1.2
74LS92	.55	74LS363	1.3
74LS93	.55	74LS364	1.9
74LS95	.75	74LS365	.4
74LS96	.89	74LS366	.4
74LS107	.39	74LS367	.4
74LS109	.39	74LS368	.4
74LS112	.39	74LS373	.9
74LS113	.39	74LS374	.9
74LS114	.39	74LS377	1.3
74LS122	.45	74LS378	1.1
74LS123	.79	74LS379	1.3
74LS124	2.90	74LS385	1.9
74LS125	.49	74LS386	.4
74LS126	.49	74LS390	1.1
74LS132	.59	74LS393	1.1
74LS133	.59	74LS395	1.1
74LS136	.39	74LS399	1.4
74LS137	.99	74LS424	2.9
74LS138	.55	74LS447	.3
74LS139	.55	74LS490	1.9
74LS145	1.20	74LS624	3.9
74LS147	2.49	74LS640	2.2
74LS148	1.35	74LS645	2.2
74LS151	.55	74LS668	1.6
74LS153	.55	74LS669	1.8
74LS154	1.90	74LS670	1.4
74LS155	.69	74LS674	9.6
74LS156	.69	74LS682	3.2
74LS157	.65	74LS683	3.2
74LS158	.59	74LS684	3.2
74LS160	.69	74LS685	3.2
74LS161	.65	74LS688	2.4
74LS162	.69	74LS689	3.2
74LS163	.65	74LS783	24.9
74LS164	.69	81LS95	1.4
74LS165	.95	81LS96	1.4
74LS166	1.95	81LS97	1.4
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7400

00	.19	74132	.45
01	.19	74138	.50
02	.19	74141	.65
03	.19	74142	2.95
04	.19	74143	2.95
05	.25	74145	.60
06	.29	74147	1.75
07	.29	74148	1.20
08	.24	74150	1.35
09	.19	74151	.55
10	.19	74152	.65
11	.25	74153	.55
12	.30	74154	1.25
13	.35	74155	.75
14	.49	74156	.65
16	.25	74157	.55
17	.25	74159	1.65
20	.19	74160	.85
21	.35	74161	.69
22	.35	74162	.85
23	.29	74163	.69
25	.29	74164	.85
26	.29	74165	.85
27	.29	74166	1.00
28	.45	74167	2.95
30	.19	74170	1.65
32	.29	74172	5.95
33	.45	74173	.75
37	.29	74174	.89
38	.29	74175	.89
40	.19	74176	.89
42	.49	74177	.75
43	.65	74178	1.15
44	.69	74179	1.75
45	.69	74180	.75
46	.69	74181	2.25
47	.69	74182	.75
48	.69	74184	2.00
50	.19	74185	2.00
51	.23	74190	1.15
53	.23	74191	1.15
54	.23	74192	.79
60	.23	74193	.79
70	.35	74194	.85
72	.29	74195	.85
73	.34	74196	.79
74	.33	74197	.75
75	.45	74198	1.35
76	.35	74199	1.35
80	.59	74221	1.35
81	1.10	74246	1.35
82	.95	74247	1.25
83	.50	74248	1.85
85	.59	74249	1.95
86	.35	74251	.75
89	2.15	74259	2.25
90	.35	74265	1.35
91	.40	74273	1.95
92	.50	74276	1.25
93	.35	74279	.75
94	.65	74283	2.00
95	.55	74284	3.75
96	.70	74285	3.75
97	2.75	74290	.95
100	1.75	74293	.75
107	.30	74298	.85
109	.45	74351	2.25
110	.45	74365	.65
111	.55	74366	.65
116	1.55	74367	.65
120	1.20	74368	.65
121	.29	74376	2.20
122	.45	74390	1.75
123	.49	74393	1.35
125	.45	74425	3.15
126	.45	74426	.85
128	.55	74490	2.55

LINEAR

LM301	.34	LM340 (see 7800)		LM566	1.49
LM301H	.79	LM348	.99	LM567	.89
LM307	.45	LM350K	4.95	NE570	3.95
LM308	.69	LM350T	4.60	NE571	2.95
LM308H	1.15	LM358	.69	NE592	2.75
LM309H	1.95	LM359	1.79	LM709	.59
LM309K	1.25	LM376	3.75	LM710	.75
LM310	1.75	LM377	1.95	LM711	.79
LM311	.64	LM378	2.50	LM723	.49
LM311H	.89	LM379	4.50	LM723H	.55
LM312H	1.75	LM380	.89	LM733	.98
LM317K	3.95	LM380N-8	1.10	LM741	.35
LM317T	1.19	LM381	1.60	LM741N-14	.35
LM318	1.49	LM382	1.60	LM741H	.40
LM318H	1.59	LM383	1.95	LM747	.69
LM319H	1.90	LM384	1.95	LM748	.59
LM319	1.25	LM388	.89	LM1014	1.19
LM320 (see 7900)		LM387	1.40	LM1303	1.95
LM322	1.65	LM389	1.35	LM1310	1.49
LM323K	4.95	LM390	1.95	MC1330	1.69
LM324	.59	LM392	.69	MC1349	1.89
LM329	.65	LM394H	4.60	MC1350	1.19
LM331	3.95	LM399H	5.00	MC1358	1.69
LM334	1.19	NE531	2.95	MC1372	6.95
LM335	1.40	NE555	.34	LM1414	1.59
LM336	1.75	NE556	.65	LM1458	.59
LM337K	3.95	NE558	1.50	LM1488	.69
LM337T	1.95	NE561	24.95	LM1489	.69
LM338K	6.95	NE564	2.95	LM1496	.85
LM339	.99	LM565	.99	LM1558H	3.10

LM1800	2.37	H = TO-5 CAN	
LM1812	8.25	T = TO-220	
LM1830	3.50	K = TO-3	
LM1871	5.49		
LM1872	5.49		
LM1877	3.25		
LM1889	1.95		
LM1896	1.75		
ULN2003	2.49		
LM2877	2.05		
LM2878	2.25		
LM2900	.85		
LM2901	1.00		
LM3900	.59		
LM3905	1.25		
LM3909	.98		
LM3911	2.25		
LM3914	3.95		
LM3915	3.95		
LM3916	3.95		
MC4024	3.95		
MC4044	4.50		
RC4136	1.25		
RC4151	3.95		
LM4250	1.75		
LM4500	3.25		
RC4558	.69		
LM13080	1.29		
LM13600	1.49		
LM13700	1.49		

RCA

CA 3023	2.75	CA 3082	1.65
CA 3039	1.29	CA 3083	1.55
CA 3046	1.25	CA 3086	.80
CA 3059	2.90	CA 3089	2.99
CA 3060	2.90	CA 3096	3.49
CA 3065	1.75	CA 3130	1.30
CA 3080	1.10	CA 3140	1.15
CA 3081	1.65	CA 3146	1.85
CA 3160	1.19		

TI

TL494	4.20	75365	1.95
TL496	1.65	75450	.59
TL497	3.25	75451	.39
75107	1.49	75452	.39
75110	1.95	75453	.39
75150	1.95	75454	.39
75154	1.95	75491	.79
75188	1.25	75492	.79
75189	1.25	75493	.89
75494	.89		

BI FET

TL071	.79	TL084	2.19
TL072	1.19	LF347	2.19
TL074	2.19	LF351	.60
TL081	.79	LF353	1.00
TL082	1.19	LF355	1.10
TL083	1.19	LF356	1.10
LF357	1.40		

CMOS

4000	.29	4527	1.95
4001	.25	4528	1.19
4002	.25	4531	.95
4006	.89	4532	1.95
4007	.29	4538	1.95
4008	.95	4539	1.95
4009	.39	4541	2.64
4010	.45	4543	1.19
4011	.25	4553	5.79
4012	.25	4555	.95
4013	.38	4556	.95
4014	.79	4581	1.95
4015	.39	4582	1.95
4016	.39	4584	.75
4017	.69	4585	.75
4018	.79	4702	12.95
4019	.39	74C00	.35
4020	.75	74C02	.35
4021	.79	74C04	.35
4022	.79	74C08	.35
4023	.29	74C10	.35
4024	.65	74C14	.59
4025	.29	74C20	.35
4028	1.65	74C30	.35
4027	.45	74C32	.39
4028	.69	74C42	1.29
4029	.79	74C48	1.99
4030	.39	74C73	.65
4034	1.95	74C74	.65
4035	.85	74C76	.80
4040	.75	74C83	1.95
4041	.75	74C85	1.95
4042	.69	74C86	.39
4043	.85	74C89	4.50
4044	.79	74C90	1.19
4046	.85	74C93	1.75
4047	.95	74C95	.99
4049	.35	74C107	.89
4050	.35	74C150	5.75
4051	.79	74C151	2.25
4053	.79	74C154	3.25
4060	.89	74C157	1.75
4066	.39	74C160	1.19
4068	.39	74C161	1.19
4069	.29	74C162	1.19
4070	.35	74C163	1.19
4071	.29	74C164	1.39
4072	.29	74C165	2.00
4073	.29	74C173	.79
4075	.29	74C174	1.19
4076	.79	74C175	1.19
4078	.29	74C192	1.49
4081	.29	74C193	1.49
4082	.29	74C195	1.39
4085	.95	74C200	5.75
4086	.95	74C221	1.75
4093	.49	74C373	2.45
4098	2.49	74C374	2.45
4099	1.95	74C901	.39
14409	12.95	74C902	.85
14410	12.95	74C903	.85
14411	11.95	74C905	10.95
14412	12.95	74C906	.95
14419	7.95	74C907	1.00
14433	4.18	74C908	2.00
4502	.95	74C909	2.75
4503	.65	74C910	9.95
4508	1.95	74C911	8.95
4510	.85	74C912	8.95
4511	.85	74C914	1.95
4512	.85	74C915	1.19
4514	1.25	74C918	2.75
4515	1.79	74C920	17.95
4516	1.55	74C921	15.95
4518	.89	74C922	4.49
4519	.39	74C923	4.95
4520	.79	74C925	5.95
4522	1.25	74C926	7.95
4526	1.25	74C928	7.95
		74C929	19.95

74S00

74S00	.32	74S163	1.95
74S02	.35	74S168	3.95
74S03	.35	74S169	3.95
74S04	.35	74S174	.95
74S05	.35	74S175	.95
74S08	.35	74S181	3.95
74S09	.40	74S182	2.95
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74S11	.35	74S189	6.95
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74S20	.35	74S195	1.49
74S22	.35	74S196	1.49
74S30	.35	74S197	1.49
74S32	.40	74S201	6.95
74S37	.88	74S225	7.95
74S38	.85	74S240	2.20
74S40	.35	74S241	2.20
74S51	.35	74S244	2.20
74S64	.40	74S251	.95
74S65	.40	74S253	.95
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74S86	.50	74S260	.79
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74S124	2.75	74S287	1.90
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74S138	.85	74S374	2.45
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74S161	1.95	74S482	15.25
74S162	1.95	74S570	2.95
		74S571	2.95

IC SOCKETS

	1-99	100
8 pin ST	.13	.11
14 pin ST	.15	.12
16 pin ST	.17	.08
18 pin ST	.20	.18
20 pin ST	.29	.27
22 pin ST	.30	.27
24 pin ST	.30	.27
28 pin ST	.40	.32
40 pin ST	.49	.39
64 pin ST	4.25	call

ST = SOLDERTAIL

8 pin WW	.59	.49
14 pin WW	.69	.52
16 pin WW	.49	.49
18 pin WW	.99	.90
20 pin WW	1.09	.98
22 pin WW	1.39	1.28
24 pin WW	1.49	1.35
28 pin WW	1.69	1.49
40 pin WW	1.99	1.80

WW = WIREWRAP

16 pin ZIF	6.75	call
24 pin ZIF	9.95	call
28 pin ZIF	10.95	call

ZIF = TEXTOOL
(Zero Insertion Force)

VOLTAGE REGULATORS

7805T	.75	7905T	.85
7808T	.75	7908T	.85
7812T	.75	7912T	.85
7815T	.75	7915T	.85
7824T	.75	7924T	.85
7805K	1.39	7905K	1.49
7812K	1.39	7912K	1.49
7815K	1.39	7915K	1.49
7824K	1.39	7924K	1.49
78L05	.69	79L05	.79
78L12	.69	79L12	.79
78L15	.69	79L15	.79
78H05K	9.95	LM323K	4.95
78H12K	9.95	UA78S40	1.95

T = TO-220 K = TO-3
L = TO-92

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6 POSITION	.90
7 POSITION	.95
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8T96	.89
8T97	.89
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Yellow	.18	.15

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MAN 74	.3"	CC	.99
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FND-507 (510)	.5"	CA	1.49

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MM5375	4.95
MM58167	8.95
MM58174	11.95
MSM5832	6.95

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ICL7106	9.95
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9601	.75
9602	1.50
96S02	1.95

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XR 2207	3.75
XR 2208	3.75
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ADC0804	3.49	DAC1020	8.25
ADC0809	4.49	DAC1022	5.95
ADC0817	9.95	MC1408L6	1.95
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$59.95

USES 2716's

Blank PC Board - $34

ASSEMBLED & TESTED ADD $30

SPECIAL: 2716 EPROM's (450 NS) Are $4.95 Ea. With Above Kit.

KIT FEATURES:

1. Uses +5V only 2716 (2Kx8) EPROM's
2. Allows up to 32K of software on line!
3. IEEE S-100 Compatible.
4. Addressable as two independent 16K blocks.
5. Cromemco extended or Northstar bank select.
6. On board wait state circuitry if needed.
7. Any or all EPROM locations can be disabled
8. Double sided PC board, solder-masked, silk-screened
9. Gold plated contact fingers.
10. Unselected EPROM's automatically powered down for low power
11. Fully buffered and bypassed
12. Easy and quick to assemble

64K S100 STATIC RAM

$229.00 KIT

NEW!

LOW POWER!

RAM OR EPROM!



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SUPPORT ICs + CAPS $17.50

FULL SOCKET SET $14.50

FULLY SUPPORTS THE NEW IEEE 696 S100 STANDARD (AS PROPOSED)

FOR 56K KIT $199

ASSEMBLED AND TESTED ADD $50

FEATURES:

- ★ Uses new 2K x 8 (TMM 2016 or HM 6116) RAMs.
- ★ Fully supports IEEE 696 24 BIT Extended Addressing.
- ★ 64K draws only approximately 500 MA.
- ★ 200 NS RAMs are standard. (TOSHIBA makes TMM 2016s as fast as 100 NS. FOR YOUR HIGH SPEED APPLICATIONS.)
- ★ SUPPORTS PHANTOM (BOTH LOWER 32K AND ENTIRE BOARD).
- ★ 2716 EPROMs may be installed in any of top 48K.
- ★ Any of the top 8K (E000 H AND ABOVE) may be disabled to provide windows to eliminate any possible conflicts with your system monitor, disk controller, etc.
- ★ Perfect for small systems since BOTH RAM and EPROM may co-exist on the same board.
- ★ BOARD may be partially populated as 56K.

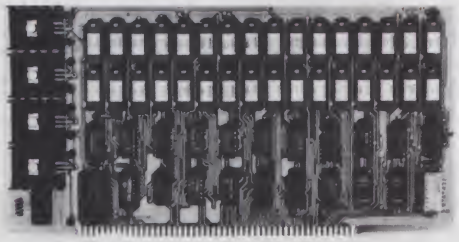
16K STATIC RAM KIT-S 100 BUSS

PRICE CUT!

$99.95 KIT

FOR 4MHZ ADD $5

PRICE CUT



KIT FEATURES:

1. Addressable as four separate 4K Blocks
2. ON BOARD BANK SELECT circuitry (Cromemco Standard†). Allows up to 512K on line!
3. Uses 2114 (450NS) 4K Static Rams
4. ON BOARD SELECTABLE WAIT STATES
5. Double sided PC Board, with solder mask and silk screened layout. Gold plated contact fingers
6. All address and data lines fully buffered
7. Kit includes ALL parts and sockets
8. PHANTOM is jumpered to PIN 67
9. LOW POWER: under 1.5 amps TYPICAL from the +8 Volt Buss
10. Blank PC Board can be populated as any multiple of 4K.

BLANK PC BOARD W/DATA-**$24**

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SUPPORT IC'S & CAPS-**$12.95**

ASSEMBLED & TESTED-**ADD $35**

OUR #1 SELLING RAM BOARD!

64K SS-50 STATIC RAM

$179.00 (48K KIT)

NEW!

LOW POWER!

RAM OR EPROM!



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SUPPORT ICs + CAPS $18.00

FULL SOCKET SET $15.00

56K Kit $219

64K Kit $249

ASSEMBLED AND TESTED ADD $50

FEATURES:

- ★ Uses new 2K x 8 (TMM 2016 or HM 6116) RAMs.
- ★ Fully supports Extended Addressing.
- ★ 64K draws only approximately 500 MA.
- ★ 200 NS RAMs are standard. (TOSHIBA makes TMM 2016s as fast as 100 NS. FOR YOUR HIGH SPEED APPLICATIONS.)
- ★ Board is configured as 3-16K blocks and 8-2K blocks (within any 64K block) for maximum flexibility.
- ★ 2716 EPROMs may be installed anywhere on Board.
- ★ Top 16K may be disabled in 2K blocks to avoid any I/O conflicts.
- ★ One Board supports both RAM and EPROM.
- ★ RAM supports 2MHZ operation at no extra charge!
- ★ Board may be partially populated in 16K increments.

STEREO! S-100 SOUND COMPUTER BOARD

NEW!

At last, an S-100 Board that unleashes the full power of two unbelievable General Instruments AY3-8910 NMOS computer sound IC's. Allows you under total computer control to generate an infinite number of special sound effects for games or any other program. Sounds can be called in BASIC, ASSEMBLY LANGUAGE, etc.

KIT FEATURES:

- ★ TWO GI SOUND COMPUTER IC'S.
- ★ FOUR PARALLEL I/O PORTS ON BOARD.
- ★ USES ON BOARD AUDIO AMPS OR YOUR STEREO
- ★ ON BOARD PROTO TYPING AREA.
- ★ ALL SOCKETS, PARTS AND HARDWARE ARE INCLUDED.
- ★ PC BOARD IS SOLDERMASKED, SILK SCREENED, WITH GOLD CONTACTS.
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- ★ USES PROGRAMMED I/O FOR MAXIMUM SYSTEM FLEXIBILITY.

Both Basic and Assembly Language Programming examples are included.

COMPLETE KIT! $59.95 (WITH DATA MANUAL)

BLANK PC BOARD W/DATA $27.50

PRICE CUT!

SOFTWARE:

SCL™ is now available! Our Sound Command Language makes writing Sound Effects programs a SNAP! SCL™ also includes routines for Register-Examine-Modify, Memory-Examine-Modify, and Play-Memory. SCL™ is available on CP/M* compatible diskette or 2708 or 2716. Diskette - **$24.95** 2708 - **$19.95** 2716 - **$29.95.** Diskette includes the source. EPROM'S are ORG at E000H. **(Diskette is 8 Inch Soft Sectored)**

NEW! G.I. COMPUTER SOUND CHIP

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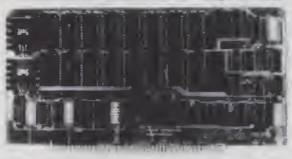
SPECIAL OFFER: ~~$14.95~~ each Add $3 for 60 page Data Manual.

32K S100 EPROM/STATIC RAM

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A&T EPROM ADD $35.00



BLANK PC BOARD WITH DATA $39.95

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FULL SOCKET SET $18

We took our very popular 32K S100 EPROM Card and added additional logic to create a more versatile EPROM/RAM Board.

FEATURES:

- ★ This one board can be used in any one of four ways:
 - A. As a 32K 2716 EPROM Board
 - B. As a 32K 2732 EPROM Board (Using Every Other Socket)
 - C. As a mixed 32K 2716 EPROM/2K x 8 RAM Board
 - D. As a 32K Static RAM Board
- ★ Uses New 2K x 8 (TMM2016 or HM6116) RAM's
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- ★ Supports 24 Bit Extended Adressing
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- ★ Supports both Cromemco and North Star Bank Select
- ★ Supports Phantom
- ★ On Board wait State Generator
- ★ Every 2K Block may be disabled
- ★ Addressed as two separate 16K Blocks on any 64K Boundary
- ★ Perfect for MP/M* Systems
- ★ RAM Kit is very low power (300 MA typical)

32K STATIC RAM KIT — $139.95

For RAM Kit A&T - Add $40

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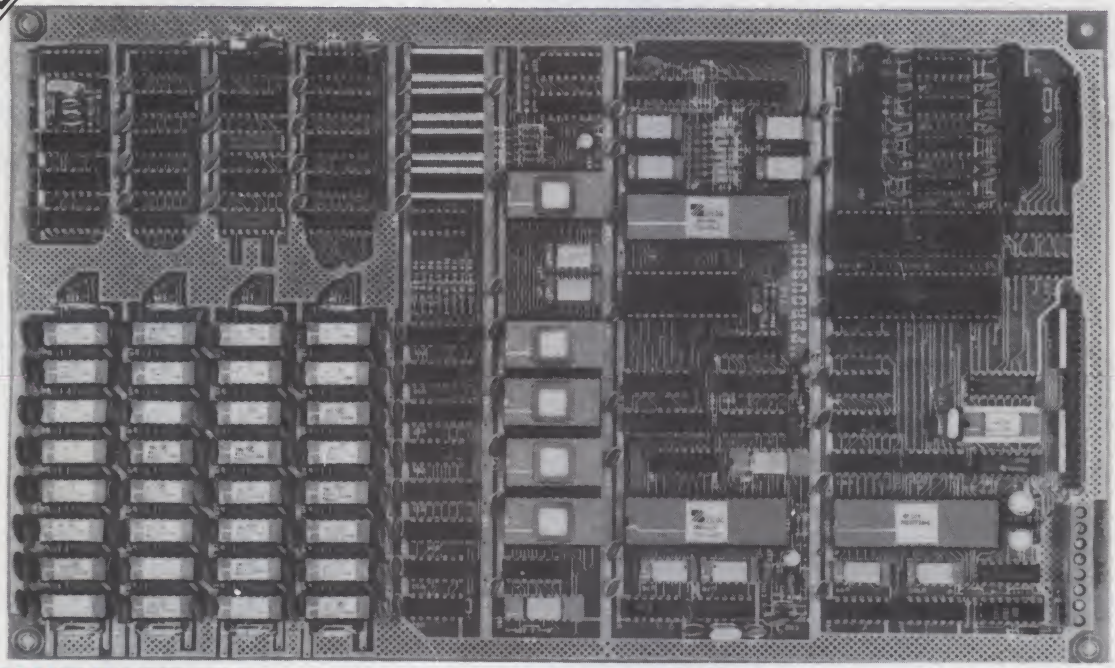
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Z-80 CPU! 64K RAM!

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Full Documentation and
Schematics — $5.

THE BIG BOARD PROJECT: With thousands sold worldwide and over two years of field experience, the Big *Board may just be one of the* most reliable single board computers available today. This is the same design that was licensed by Xerox Corp. as the basis for their 820 computer.

The Big Board gives you the right mix of most needed computing features all on one board. The Big Board was designed from scratch to run the latest version of CP/M*. Just imagine all the off-the-shelf software that can be run on the Big Board without any modifications needed.

$319.00 ** (64K KIT BASIC I/O)

SIZE: 8½ x 13¾ IN.
SAME AS AN 8 IN. DRIVE.
REQUIRES: +5V @ 3 AMPS
+ - 12V @ .5 AMPS.

FULLY SOCKETED!

FEATURES: (Remember, all this on one board!)

64K RAM

Uses industry standard 4116 RAM's. All 64K is available to the user, our VIDEO and EPROM sections do not make holes in system RAM. Also, very special care was taken in the RAM array PC layout to eliminate potential noise and glitches.

Z-80 CPU

Running at 2.5 MHZ. Handles all 4116 RAM refresh and supports Mode 2 INTERUPTS. Fully buffered and runs 8080 software.

SERIAL I/O (OPTIONAL)

Full 2 channels using the Z80 SIO and the SMC 8116 Baud Rate Generator. FULL RS232! For synchronous or asynchronous communication. In synchronous mode, the clocks can be transmitted or received by a modem. Both channels can be set up for either data-communication or data-terminals. Supports mode 2 Int. Price for all parts and connectors: $39.95

BASIC I/O

Consists of separate parallel port (Z80 PIO) for use with an ASCII encoded keyboard for input. Output would be on the 80 x 24 Video Display.

BLANK PC BOARD — $119

The blank Big Board PC Board comes complete with full documentation (including schematics), the character ROM, the PFM 3.3 MONITOR ROM, and a diskette with the source of our BIOS, BOOT, and PFM 3.3 MONITOR.

24 x 80 CHARACTER VIDEO

With a crisp, flicker-free display that looks extremely sharp even on small monitors. Hardware scroll and full cursor control. Composite video or split video and sync. Character set is supplied on a 2716 style ROM, making customized fonts easy. Sync pulses can be any desired length or polarity. Video may be inverted or true. 5 x 7 Matrix - Upper & Lower Case.

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Uses WD1771 controller chip with a TTL Data Separator for enhanced reliability. IBM 3740 compatible. Supports up to four 8 inch disc drives. Directly compatible with standard Shugart drives such as the SA800 or SA801. Drives can be configured for remote AC off-on. Runs CP/M* 2.2.

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Uses Z-80 PIO. Full 16 bits, fully buffered, bi-directional. Uses selectable hand shake polarity. Set of all parts and connectors for parallel I/O: $19.95

REAL TIME CLOCK (OPTIONAL)

Uses Z-80 CTC. Can be configured as a Counter on Real Time Clock. Set of all parts: $9.95

CP/M* 2.2 FOR BIG BOARD

The popular CP/M* D.O.S. to run on Big Board is available for $139.00.

BIG BOARD SOFTWARE SPECIAL — $149

Through special arrangement with CDL we offer a powerful package of TDL Z-80 software that has a suggested retail of almost $600. Includes: Extended Disk Business Basic, ZEDIT text editor, MACRO II Macro Assembler, LINKER, DEBUG I and DEBUG II. Supplied on 8 in. diskette with extensive manual.

PFM 3.3 2K SYSTEM MONITOR

The real power of the Big Board lies in its PFM 3.3 on board monitor. PFM commands include: Dump Memory, Boot CP/M*, Copy, Examine, Fill Memory, Test Memory, Go To, Read and Write I/O Ports, Disc Read (Drive, Track, Sector), and Search PFM occupies one of the four 2716 EPROM locations provided. Z-80 is a Trademark of Zilog.

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7400

7400	18	7430	17	7482	.65	74128	.45	74176	.75	LINEAR	
7402	16	7437	.21	7485	.50	74136	.39	74177	.75	LM300H	.35
7403	16	7438	.24	7486	.35	74141	.49	74180	.85	LM301N	.30
7404	16	7440	16	7489	3.25	74145	.45	74182	.75	LM301H	.45
7405	.21	7443	.46	7490	.30	74148	1.20	74186	6.50	LM307H	.45
7406	.25	7444	.69	7491	.35	74152	.55	74190	.75	LM308AN	2.25
7408	.22	7445	.55	7492	.35	74153	.55	74191	.75	LM309K	1.25
7409	.17	7447	.45	7493	.30	74154	1.25	74192	.85	LM310	1.45
7410	.17	7448	.55	7494	.65	74155	.55	74194	.85	LM311	.50
7412	.21	7450	.16	7495	.45	74160	.65	74195	.75	LM317K	3.85
7413	.21	7451	.16	74107	.30	74161	.65	74197	.60	LM318H	1.45
7414	.32	7454	.18	74109	.38	74164	.69	74221	1.10	LM322	1.55
7416	.25	7472	.23	74110	.45	74165	.69	74279	.65	LM323K	4.95
7420	.16	7474	.28	74121	.28	74166	.90	74293	.65	LM324	.55
7425	.24	7475	.38	74122	.35	74173	.65	74298	.85	LM339	.95
7426	.29	7478	.30	74123	.39	74174	.89	74367	.55	LM348	1.25
7427	.25	7480	.46	74125	.35	74175	.75	74393	1.35	LM356	.85
7429	.40									LM380	1.10
										LM381	1.85
										LM386	1.40

74LS

										LM531	1.95
74LS00	.21	74LS55	.25	74LS139	.50	74LS194	.85	74LS299	1.95		
74LS02	.24	74LS73	.38	74LS145	1.15	74LS195	.85	74LS323	4.55	LM555	.27
74LS03	.24	74LS74	.35	74LS147	1.75	74LS196	.75	74LS352	1.05	LM556	1.10
74LS04	.23	74LS75	.38	74LS148	1.35	74LS197	.75	74LS353	1.05	LM558	2.45
74LS05	.20	74LS78	.38	74LS151	.55	74LS221	.95	74LS365	.45	LM565	.95
74LS08	.24	74LS78	.42	74LS153	.50	74LS240	.95	74LS366	.45	LM566	1.45
74LS09	.24	74LS83	.46	74LS154	1.75	74LS241	.95	74LS367	.75	LM703	.75
74LS10	.23	74LS85	.60	74LS155	.75	74LS242	.95	74LS368	.45	LM709	.40
74LS11	.30	74LS86	.30	74LS158	.75	74LS243	1.25	74LS373	.90	LM710	.75
74LS12	.29	74LS90	.50	74LS157	.55	74LS244	.85	74LS374	.95	LM711	.49
74LS13	.40	74LS91	.85	74LS158	.85	74LS245	1.85	74LS375	.75	LM720	1.75
74LS14	.45	74LS92	.50	74LS160	.89	74LS247	1.10	74LS377	.95	LM723	.55
74LS15	.29	74LS93	.50	74LS161	.85	74LS248	1.10	74LS378	.95	LM733	.95
74LS20	.24	74LS95	.85	74LS162	.89	74LS249	1.10	74LS379	1.10	LM741-8	.35
74LS21	.20	74LS96	.89	74LS163	.85	74LS251	.55	74LS388	.45	LM741N-14	.35
74LS22	.24	74LS107	.36	74LS164	.65	74LS253	.55	74LS390	1.15	LM741H	.35
74LS26	.26	74LS109	.38	74LS165	.65	74LS257	.50	74LS393	1.15	LM747	.85
74LS27	.26	74LS112	.36	74LS166	1.75	74LS258	.55	74LS395	1.15	LM775	.25
74LS26	.26	74LS113	.36	74LS168	1.55	74LS259	1.25	74LS399	1.25	1330	1.60
74LS30	.24	74LS114	.36	74LS169	1.55	74LS260	.55	74LS490	1.75	1349	1.75
74LS32	.27	74LS122	.45	74LS170	1.35	74LS266	.55	74LS623	1.75	1350	1.15
74LS33	.35	74LS123	.65	74LS173	.65	74LS273	1.45	74LS668	1.25	1356	1.35
74LS37	.30	74LS125	.45	74LS174	.55	74LS279	.45	74LS669	1.25	1372	4.95
74LS36	.32	74LS126	.46	74LS175	.65	74LS280	1.65	74LS670	1.45	1458	.55
74LS42	.45	74LS132	.56	74LS181	1.95	74LS283	.85	74LS863	2.75	1488	.85
74LS46	.75	74LS133	.55	74LS190	.89	74LS290	.95	74LS865	2.75	1489	.85
74LS49	.75	74LS136	.38	74LS191	.89	74LS293	.65	74LS867	3.50	1498	.85
74LS51	.24	74LS137	.85	74LS192	.75	74LS295	.95	74LS763	16.95	1889	1.55
74LS54	.25	74LS138	.50	74LS193	.75	74LS298	.85			4501	1.50
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74S

										VOLTAGE REGULATORS	
74S00	.30	74S32	.40	74S138	.85	74S194	1.25	74S280	1.75		
74S02	.30	74S37	.85	74S140	.40	74S195	1.25	74S287	2.95	7805	
74S03	.30	74S38	.85	74S151	.95	74S201	6.50	74S288	1.75	7806	
74S04	.30	74S50	.25	74S157	.95	74S240	1.95	74S289	5.95	7808	
74S05	.30	74S51	.25	74S158	.95	74S241	1.95	74S299	5.95	7812	
74S08	.30	74S64	.35	74S181	1.75	74S244	2.95	74S373	2.45	7818 -85	
74S09	.35	74S65	.35	74S183	3.75	74S251	.85	74S374	2.45	7905	
74S10	.35	74S74	.50	74S174	.95	74S253	.85	74S387	1.90	7908	
74S11	.35	74S85	1.25	74S175	.95	74S257	.65	74S454	4.50	7912	
74S15	.35	74S86	.35	74S182	1.75	74S258	.85	74S471	4.75	7918	
74S20	.35	74S112	.45	74S168	1.55	74S260	.55	74S472	4.75		
74S22	.35	74S124	2.50	74S189	4.95	74S275	12.95	74S474	4.75		
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2708	3.95								

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LS02	.24	LS165	.85
LS03	.24	LS166	.99
LS04	.24	LS169	1.25
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LS08	.24	LS175	.50
LS10	.24	LS181	1.99
LS11	.24	LS191	.90
LS12	.30	LS192	.80
LS14	.50	LS193	.80
LS20	.24	LS195	.65
LS21	.25	LS221	.80
LS27	.24	LS240	.75
LS30	.24	LS241	.80
LS32	.36	LS242	.90
LS42	.49	LS243	.90
LS51	.24	LS244	.90
LS74	.30	LS245	1.50
LS85	.60	LS251	.50
LS86	.39	LS257	.45
LS90	.50	LS258	.45
LS93	.55	LS266	.50
LS109	.39	LS273	1.25
LS112	.39	LS279	.45
LS123	.75	LS283	.60
LS124	2.75	LS290	.85
LS125	.45	LS293	.85
LS132	.50	LS298	.89
LS133	.49	LS299	1.60
LS138	.50	LS366	.45
LS139	.50	LS367	.40
LS151	.50	LS368	.40
LS153	.50	LS373	.99
LS154	1.75	LS374	.75
LS155	.50	LS375	1.19
LS156	.55	LS377	1.49
LS157	.60	LS378	.85
LS161	.60	LS390	1.19
LS162	.65	LS393	1.19
LS163	.50	LS399	.99

TTL

7400	.19
7402	.19
7404	.19
7406	.19
7408	.19
7410	.19
7438	.22
7440	.19
7474	.29
7486	.29
74109	.45
74125	.49
74154	1.19
74175	.79
74367	.59

74S

74S04	.30
74S138	.80
74S240	1.99
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1702A 256X8 1 us	2.00
2708 1KX8 450 n.s.	2.20
27A08 1KX8 350 n.s.	3.95
2758 1KX8 +5V 450 n.s	3.95
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2716-1 2KX8 350 n.s.	7.95
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4116-16KX1-250 n.s.	8/9.00
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8000

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8035	2.95
8039	3.95
8080A	2.00
8085	5.95
8085A-2	7.00
8088	20.00
8748	15.95

8200

8212	1.25
8214	2.00
8216	1.50
8224	1.50
8228	3.00
8251	3.95
8253	2.95
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Z80

Z80 2.5 MHZ CPU	3.50
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3.000	1.15
3.579545	.75
3.579545 - HC18	1.19
4.000	2.49
4.433618	.75
4444.000	1.25
4.914304	1.50
4.9152	1.00
4.916 Bd. Rate	1.99
5.000000	1.50
5.0688	2.49
5.616	1.59
8.000	1.99
9.90000	1.25
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Circle 269 on Reader Service card.

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S-100 MEMORY BOARDS

64K STATIC RAM - Jade

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Printers From JADE

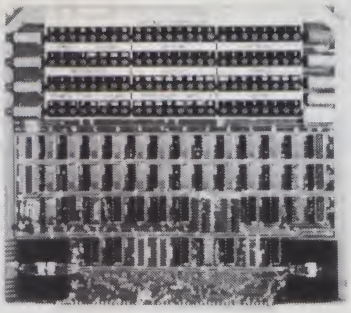
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MEM-99520K *Kit with software* ____ **$189.95**
MEM-99520A *A & T with software* ____ **$249.95**

32K PROM/RAM Board

The 32K S-100 PROM/RAM board can hold up to 16 each 2716 style EPROMs, 6116 style RAMs, or 8 each style EPROMs. This board was designed to fit into holder S-100 systems as well as the newer IEEE-696 machines. Uses 5 volt only EPROM/RAMs, allows operation as a 2K to 32K board, meets IEEE-696 S-100 proposed standard, addressable as two 16K blocks on any 64K page, supports Cromemco as well as Northstar bank select, perfect for MP/M systems

MEM-99153B *Bare board & manual* ____ **$49.95**
MEM-99153K *Kit with No RAM* ____ **$89.95**
MEM-99153A *A & T with No RAM* ____ **$139.95**
MEM-16153K *Kit with 16K RAM* ____ **$129.95**
MEM-16153A *A & T with 16K RAM* ____ **$179.95**
MEM-32153K *Kit with 32K RAM* ____ **$179.95**
MEM-32153A *A & T with 32K RAM* ____ **$229.95**
Call Us For Lowest Prices On EPROMs - 2732s ____ **$4.90**

DUAL DISK SUB-SYSTEMS

Disk Sub-Systems - Jade

Handsome metal cabinet with proportionally balanced flow system, rugged dual drive power supply, power ca kit, power switch, line coard, fuse holder, cooling fan, ne mar rubber feet, all necessary hardware to mount 2-8" drives, power supply, and fan, does not include signal ca

Dual 8" Sub-Assembly Cabinet

END-000420 *Bare cabinet* ____ **$49**
END-000421 *Cabinet kit* ____ **$199**
END-000431 *A & T* ____ **$249**

8" Sub-Systems - Single Sided, Double Density

END-000423 *Kit w/2 Siemens FD100-8Ds* ____ **$650**
END-000424 *A & T w/2 Siemens FD100-8Ds* ____ **$695**
END-000433 *Kit w/2 Shugart SA-801Rs* ____ **$999**
END-000434 *A & T w/2 Shugart SA-801Rs* ____ **$1195**

8" Sub-Systems - Double-Sided Double Density

END-000426 *Kit w/2 Qume DT-8s* ____ **$1224**
END-000427 *A & T w/2 Qume D-8s* ____ **$1424.**
END-000436 *Kit w/2 Shugart SA-851Rs* ____ **$1274**
END-000437 *A & T w/2 Shugart SA-851Rs* ____ **$1474**

8" SLIMLINE SUB-SYSTEMS

Dual Slimline Sub-systems - Jade

Handsome vertical cabinet with scratch resistant ba enamel finish, proportionally balanced air flow system, q cooling fan, rugged dual drive power supply, power cab power switch, line cord, fuse holder, cooling fan, necessary hardware to mount 2-8" slimline disk drives, d not include signal cable.

Dual 8" Slimline Cabinet

END-000820 *Bare cabinet* ____ **$59**
END-000822 *A & T w/o drives* ____ **$179**

Dual 8" Slimline Sub-Systems

END-000823 *Kit w/2 SS DD* ____ **$919**
END-000824 *A & T w/2 SS DD* ____ **$949**
END-000833 *Kit w/2 DS DD* ____ **$1149**
END-000834 *A & T w/2 DS DD* ____ **$1179**

S-100 CPU BOARDS

SBC-200 - SD Systems

4 MHz Z-80A CPU with serial & parallel I/O, 1K RAM, ROM space, monitor PROM included.

CPC-30200A *A & T* ____ **$329**

THE BIG Z - Jade

2 or 4 MHz switachable Z-80 CPU board with serial I accommodates 2708, 2716, or 2732 EPROM, baud rates fr 75 to 9600.

CPU 30201B *Bare board w/manual* ____ **$35**
CPU-30201K *Kit with Manual* ____ **$149**
CPU-30201A *A & T with Manual* ____ **$199**

2810 Z-80 CPU - C.C.S.

2 or 4 MHz Z-80 CPU with serial IO port & on board mon PROM, front panel compatible.

CPU-30400A *A & T with PROM* ____ **$289**

CPU-Z CompuPro

2 or 4 MHz Z80A CPU, 24 bit addressing.

CPU-30500A *2/4 MHz A & T* ____ **$279**
CPU-30500C *3/6 MHz CSC* ____ **$374**

8085/8088 - CompuPro

Both 8 & 16 bit CPUs, standard 8 bit S-100 bus, up to 8 M accesses 16 Megabytes of memory.

CPU-20510A *6 MHz A & T* ____ **$398**
CPU-20510C *6/8 MHz CSC* ____ **$497**

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1/4 DISK DRIVES

don TM100-1 *single-sided double-density 48 TPI*
M-551001 _____ $219.95 ea 2 for **$199.95 ea**

gart SA400L *single-sided double-density 40 track*
M-104000 _____ $234.95 ea 2 for **$224.95 ea**

don TM100-2 *double-sided double-density 48 TPI*
M-551002 _____ $294.95 ea 2 for **$269.95 ea**

C FD55A *single-sided double-density 40 track*
M-660551 _____ *$299.95 ea 2 for* **$239.95**

5¼" Cabinets with Power Supply

D-000216 *Single cab w/power supply* _____ **$69.95**
D-000226 *Dual cab w/power supply* _____ **$94.95**

-100 OTHERBOARDS

ISO-BUS - Jade

Silent, simple and on sale - a better motherboard.

6 Slot (5¼" x 8⅝")

S-061B *Bare board* _____ **$22.95**
S-061K *Kit* _____ **$39.95**
S-061A *A & T* _____ **$69.95**

12 Slot (9¾" x 8⅝")

S-121B *Bare board* _____ **$34.95**
S-121K *Kit* _____ **$69.95**
S-121A *A & T* _____ **$109.95**

18 Slot (14½" x 8⅝")

S-181B *Bare board* _____ **$54.95**
S-181K *Kit* _____ **$99.95**
S-181A *A & T* _____ **$149.95**

DISK DRIVES

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-201120 _____ *$274.95 ea 2 for* **$249.95 ea**

gart SA801R *single-sided double-density*
-10801R _____ $394.95 ea 2 for **$389.95 ea**

gart SA851R *double-sided double-density*
-10851R _____ $554.95 ea 2 for **$529.95 ea**

ne DT-8 *double-sided double-density*
-750080 _____ $524.95 ea 2 for **$498.95 ea**

don TM848-1 *Single-sided double-den thin-line*
-558481 _____ *$379.96 ea 2 for* **$369.95 ea**

don TM848-2 *double-sided double-den thin-line*
-558482 _____ *$494.95 ea 2 for* **$484.95**

C FD1165 *double-sided double-density ½ high*
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IOM-5620A *1200/300 baud Deluxe* _____ **$369.95**
IOM-5650A *300 baud for Osborne* _____ **$119.95**
IOM-5630A *300 baud card for IBM* _____ **$269.95**

SMARTMODEM - Hayes

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IOK-1500A *Hayes Chronograph* _____ **$218.95**
IOM-1100A *Micromodem 100* _____ **$368.95**
IOM-2010A *Micromodem II w/ Term prgm* _____ **$329.95**
IOM-2012A *Terminal program for MMII* _____ **$89.95**

1200 BAUD SMART CAT - Novation

103 212 Smart Cat & 103 Smart Cat. 1200 & 300 baud, built-in dialer, auto re-dial if busy, auto answer disconnect, direct connect, LED readout displays mode, analog digital loop-back self tests, usable with multi-line phones.

IOM-5241A *300 baud 103 Smart Cat* _____ **$229.95**
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1/5 the size of ordinary modems, Bell 103, manual or auto-answer, automatic answer/orginate, direct connect, built-in self-test, two LEDs and audio beeps provide status information.

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8" or 5¼" DMA disk controller, single or double density, single or double sided, 10MHz.

IOD-1810A *A & T* _____ **$449.95**
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Double density disk controller for any combination of 5¼" and 8" single or double sided, analog phase-locked loop data separator, vectored interrupts. CP/M 2.2 & Oasis compatible, contro/diagnostic software PROM included.

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SFC-55009047F *CP/M 3.0 with VF-II* _____ **$139.95**

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5¼" or 8" double density disk controller with on-board boot loader ROM, free CP/M 2.2 & manual set.

IOD-1300A *A&T with CP/M 2.2* _____ **$399.95**

DOUBLE D - Jade

High reliability double density disk controller with on-board Z-80A, auxiliary printer port, IEEE S-100 can function in multi-user interrupt driven bus.

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IOD-1200K *Kit w/hdwr & sftwr man* _____ **$299.95**
IOD-1200A *A & T w/hdwr & sftwr man* _____ **$325.95**
SFC-59002001F *CP/M 2.2 with Double D* _____ **$99.95**

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Single board, standard size S-100 computer system, 4 MHz Z-80A single or double density disk controller for 5¼" or 8" drives, 64K RAM, extended addressing, up to 4K of EPROM, 2 serial & 2 parallel I/O ports, real time interrupt clock, CP/M compatible

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APPLE DISK DRIVE - Apple Compatible

Totally Apple compatible, 143,360 bytes per drive on DOS 3.3, full one year factory warranty, half-track capability reads all Apple software, plugs right into Apple controller as second drive, DOS 3.3, 3.2.1, Pascal, & CP/M compatible.

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Expand your Apple II to 64K, use as language card, full 1 year warranty. Why spend $175.00 ?

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KS CNDDB25S	25 Pin Female	$4.00	$3.50	$3.25	$3.00
KS CNDDB51212	1 Pc. Grey Hood	$1.65	$1.40	$1.25	$1.15
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KS CNDDB51226	2 Pc. Black Hood	$1.75	$1.50	$1.35	$1.20
KS CNDD20416	Hardware set 2/Pr.	$1.00	$.80	$.70	$.60

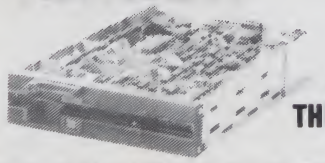
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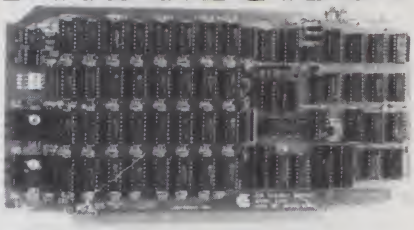
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KSEPDORANGE	6 outlet 4½" cord w/power switch	$139.95	$104.95
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64K IEEE/S-100 DYNAMIC RAM

2 or 4MHz BANK SELECTABLE



- 2 or 4 MHz operation
- Designed to IEEE proposed S-100 bus standards
- Supports IMSAI-type front panels
- Operates with either an 8080 or Z-80 based S-100 system providing processor transparent refreshes with both
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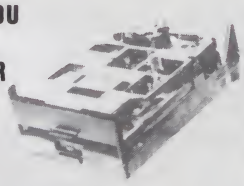
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IBM PC™ COMPATIBLE MODEM CARD
Features all the same specifications as standalone unit.

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KS PDBRIXIBM Card and Software (3 lbs.) ***$539.00***

(SEE PAGE 431 IN MAY ISSUE OF BYTE)

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HAYES SMARTMODEM COMPATIBLE
The ***PASSWORD***
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$425.00

ASSWORD puts any micro computer into a telecommuting network with 00/1200 baud speed, programmable auto dial and auto answer capability. uto mode and auto speed select, audio phone line monitor, and other dvanced features. So simple, one button operates it. So compact it mounts n the back of a computer with Velcro®.

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ELPAC, the USR software package, programs computers to exploit all the utomatic dialing features of the USRPASSWORD and USRADIAL212A odems, inlcuding timed calls, login-logoff, custom phone directories, access asswords, and much more!

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DIRECT CONNECT MODEM
$79.00
0 - 300 BAUD
MURA MM-100
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NEW!

- 0 - 300 baud
- RS232C interface
- Full duplex
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	List Price	SALE
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SAVE $160.00!!

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● 5 x 7 Dot Matrix ● Parallel Interface (Centronics) ● Tractor Feed ● Dot Addressable Graphics ● Up to 3-Part Paper ● Self Test ● One Year Warranty ● 30 CPS 80 Column Unidirectional ● Uses Regular Paper

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100CPS 9 DOT MATRIX PRINTER

● Centronics parallel interface ● 9 x 9 character matrix ● 6 x 6 block graphic matrix ● Bit image (7 or 8) x 480 dot matrix (single density) (7 or 8) x 960 dot matrix ● Bi-directional printing with logic seeking ● 40, 48, 66, 80, 96, or 132 characters per line ● 96 ASCII characters ● 5, 6, 8.5, 10, 12, or 17 characters per inch ● 1/6, 1/8, n/72, n/144 Line pitch ● Sprocket or friction feed ● Uses a standard underwood ribbon

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SALE PRICE: $359.00
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*Based on 10 characters per inch

SERIAL INTERFACE CARD FOR GEMINI 10 & 15
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12" RGB COLOR MONITOR
380 HORIZONTAL LINE RESOLUTION



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List Price: $399.00
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Interface cable to IBM **$19.00**

KS TAXRGBAPL
Apple IIe & III cable **$19.00**

WITH APPLE II RGB INTERFACE
KS PDBTAXRGBAPL
List Price: $528.00 ***$359.00***

12" RGB SUPER HIGH RESOLUTION MONITOR
630 HORIZONTAL LINE RESOLUTION

- 18MHz bandwidth
- Linear RGB input provides unlimited color combintations
- Compatible with APPLE III and IBM P/C

KS TAXRGB3
LIST PRICE: $699.00
(Sh. Wt. 29 lbs.)

SALE PRICE: $595.00

SUPER HIGH RESOLUTION RGB MONITOR WITH AN APPLE INTERFACE CARD
KS PDBRGB3APL *$695.00*

RGB VIDEO INTERFACE WITH 80 CHARACTER ALPHANUMERIC FORMAT FOR THE APPLE IIe
KS TAX41080 APPLE IIe RGB Int. List $199.00 **SALE: $189.00**

12" AMBER OR GREEN HIGH RESOLUTION VIDEO MONITOR



- >18 MHz bandwidth
- 800 line horizontal resolution
- Composite video input

KS TAXKG12N Green
KS TAXKG12NUY Amber
LIST PRICE $179.00
(Shipping Weight 19 lbs.)

SALE PRICE: $129.00

ULTRA MAGNETICS 5¼" FLOPPY DISKETTES
LIFETIME WARRANTY!

DOUBLE DENSITY!

FEATURES:
- Includes reinforcement ring
- Write protect with tabs
- 100% Surface tested
- Lifetime warranty



SALE!

SINGLE SIDED
40 TRACKS — DOUBLE DENSITY
ORDER INFORMATION:
KS ULT51401 Soft Sector
KS ULT51410 10 Sector
KS ULT51416 16 Sector

BOX OF	
10	***$25.00***
2 BOXES:	***$40.00***
10 BOXES:	***$180.00***

Description	Box of 10	2 Boxes	10 Boxes
KS ULT52401 Soft sector, 40 track, 2 side **KS ULT52410** 10 sector, 40 track, 2 side **KS ULT52416** 16 sector, 40 track, 2 side	**$35.00**	**$60.00**	**$280.00**
KS ULT51801 Soft sector, 80 track, 1 side **KS ULT51810** 10 sector, 80 track, 1 side **KS ULT51816** 16 sector, 80 track, 1 side	**$30.00**	**$50.00**	**$220.00**
KS ULT52801 Soft sector, 80 track, 2 sided **KS ULT52810** 10 sector, 80 track, 2 sided **KS ULT52816** 16 Sector, 80 track, 2 sided	**$40.00** (Sh. Wt. 2 lbs)	**$70.00** (Sh. Wt. 4 lbs.)	**$320.00** (Sh. Wt. 20 lbs.)

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PRIORITY ONE ELECTRONICS
9161 DEERING AVE. CHATSWORTH, CA 91311

MasterCard NEDA

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Terms: U.S. VISA, MC, BAC, Check, Money Order, U.S. Funds Only. CA residents add 6½% Sales Tax. MINIMUM PREPAID ORDER $15.00. Include MINIMUM SHIPPING & HANDLING of $3.00 for the first 3 lbs. plus 40¢ for each additional pound. Orders over 50 lbs. sent freight collect. Just in case, please include your phone number. Prices subject to change without notice. We will do our best to maintain prices through July, 1983. Credit Card orders will be charged appropriate freight. We claim no responsibility for typographical errors. Sale prices for prepaid orders only.

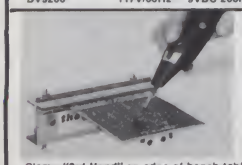
RETAIL STORE PHONE NUMBERS: (Chatsworth:) (213) 709-5464 - (Irvine:) (714) 660-1411

Wall Transformers AC and DC Types



AC250 (Pictured)

Part No.	Input	Output	Price
AC 250 (above)	117V/60Hz	12VAC 250mA	$3.95
AC 500	117V/60Hz	12VAC 500mA	$4.95
AC1000	117V/60Hz	12VAC 1 amp	$5.95
AC9004	117V/60Hz	9.2VAC 2.5 amp	$3.95
DC 800	120V/60Hz	8VDC 400mA	$1.95
DC6912	120V/60Hz	8,9,12VDC 300mA	$8.95
DC5490	117V/60Hz	9.5VDC 275mA	$2.95
DC900	120V/60Hz	9VDC 500mA	$3.95
DC1200	120V/60Hz	9.5VDC 300mA	$2.95
DV9200	117V/60Hz	9VDC 200mA	$3.25



PCB-3 Makes Circuit Assembly A Breeze!

Lets you work with both hands. Sturdy aluminum construction.

Clamp *"3rd Hand"* on edge of bench table or workboard. Insert circuit board, position components. Notice convenient working angle. Flip circuit board to flat position for soldering and clipping. Reverse procedure for double-sided boards.

PCB-3 $13.95

Extension to hold PCB-3 2" from bench and 8" from front edge.

PCB-X $6.95



Mostek DC/DC Converter +5 VOLTS TO -9 VOLTS

Input: +5V. Output: -9V (regulated) @ 30mA. Printed circuit mounting. Specifications incl.

DC10 $2.95 ea. or 2/$4.95

Jameco ELECTRONICS Digital Thermometer Kit



Dual sensors — switch controls for indoor/outdoor or dual monitoring — can be extended to 500 feet. Continuous LED .8" ht. display. Range: -40°F to 199°F, -40°C to 100°C. Accuracy ±1° nominal. Calibrate for Fahrenheit/Celsius. Simulated walnut case. AC wall adapter included. Size: 6⅝"L x 3½"H x 1¾"D.

JE300 $39.95

RADIO CONTROL CIRCUITS



Ideal to use for:
- Toys, hobby crafts, robots, trains
- Burglar alarms • IR data link
- Remote slide projector control
- Consumer remote data links
- Energy-saving, remotely switched lighting systems

A complete 8-channel digital encoder and RF transmitter; low power, at frequency of 27MHz or 49MHz, a field strength of 10,000uV meter at 3 meters. 9V operation on chip RF oscillator/transmitter, on chip 4.6 regulator. Up to 80MHz carrier frequency operation.

LM1871N RC Encoder/Transmitter Chip ... $1.95

A complete RF receiver/decoder, used at either 27MHz, 49MHz or 72MHz. It provides 4 independent channels when used with LM1871 (2 analog, 2 dig.) operates from four 1.5V cells, Crystal controlled.

LM1872N	RC Receiver/Decoder Chip	$2.49
SRX1504	49.435MHz Crystal (LM1872N) ...	$3.95
SRX1505	49.890MHz Crystal (LM1871N) ...	$3.95

ATARI



ATARI PADDLES

JSP(2) $4.95 pair

ATARI DRIVER

JSD(1) $2.95 ea.



TV GAME SWITCH

Used on Atari. Cosmetically blemished. 100% functional.

TGS-1 ... $2.95 ea.

BOOKS

NATIONAL SEMICONDUCTOR — INTERSIL — INTEL

30003	National Linear Data Book (1982) (1376 pages) LM, LF, ADC, DAC, LH Series	$11.95
30008	National Memory Data Book (1980) (464 pages) RAMs, ROMs, PROMs, EPROMs Series	$8.95
30009	Intersil Data Book (1983) (1356 pages) Complete line.	$9.95
30010	National Audio/Radio Handbook (1980) (240 pages) Pre-Amps, AM, FM & FM Stereo, Power Amps	$5.95
30011	National Linear Application Handbook (1980) (736 pages) Application Notes, Linear Briefs, etc.	$15.95
30012	National PAL Data Book (1982) (176 pages) Application Notes, Linear Briefs, etc.	$5.95
30013	Zilog Data Book (1983) (641 pages) Microprocessors and Support Chips	$7.95
210830	Intel Memory Components Handbook (1983) (798 pages) Contains all Application Notes, Article Reprints, Data Sheets, and other design information on Intel's RAMs, EPROMs, E²PROMs & Bubble Memories.	$14.95
210844	Intel Microprocessor & Peripheral Handbook (1983) (1027 pages) Contains Data Sheets on all of Intel's Microprocessors and Peripherals.	$14.95

Universal Computer Keyboard Enclosures



"DTE" Blank Desk-Top Enclosures are designed for easy modification. High strength epoxy molded end pieces in mocha brown finish. Sliding rear/bottom panel for service/component access. Top/bott. panels .080" thick alum. alodine type 1200 finish (gold tint color) for best paint adhesion after modification. Vented top & bottom panels for cooling efficiency. Rigid construction provides unlimited applications. Assembly instructions included.

DTE-8	Panel Width 7.5"	$24.95
DTE-11	Panel Width 10.13"	$27.95
DTE-14	Panel Width 13.5"	$29.95
DTE-20	Panel Width 19.25"	$34.95

TIMEX sinclair 1000



• Powerful - fully programmable 2K memory • Portable - 6¾" x 6¾" x 1⅝" - 12 oz. • Expandable - Optional 16K RAM module • Single-key entry commands • Educational • Unique syntax-check report codes for error identity • Accurate to 9½ decimal places for full range math and scientific functions • Graph drawing and animated display • Advanced 4-chip design combining power, portability and affordable price.

TS1000 $69.95

ACCESSORIES FOR TIMEX sinclair 1000 and ZX81

TIMEX sinclair 1016 Expansion from 2K to 16K, size: 3" x 3" x 1.5" (5 oz) TS1016 $49.95

TIMEX sinclair 2040 32 column thermal printer (4 lbs) TS2040 $99.95

Keyboard Mask for Your ZX81/1000* Computer

BRAND NEW!!



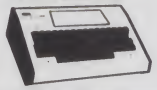
FEATURES:
- Install in seconds. Removes adhesive backing from mask and place over keyboard
- All characters and symbols reproduced on mask
- Durable — formed with poly carbonite sheet-satin finish.

JE681 KEYBOARD MASK

The JE681 Keyboard Mask provides users of the ZX81/1000 series computer the individual feel of each keypad on the keyboard. The mask has a raised outline around each keypad allowing the user to feel and correctly position their fingers onto the keyboard.

JE681 KEYBOARD MASK $9.95 each

Jameco ELECTRONICS ZX81/1000* Keyboard Conversion Kit



JE682 AK KEYBOARD KIT MOUNTED IN OTE AK ENCLOSURE. LIGHT TAN PANELS WITH MOLDED DARK BROWN END PIECES. SIZE 14¾"W x 3½"D x 3½"H

The JE682 Kit provides users of the ZX81/1000 series computers a full-size industrial keyboard hook up to their computer. The JE682 Kit allows the use of either the full size keyboard or the Sinclair/Timex Keyboard. The Kit also permits the simple disconnection of the Sinclair/Timex Keyboard for portable use. The JE682 Kit consists of a full-size industrial grade keyboard with 62 keys, 2 p.c. boards, 24" ribbon cable, DIP socket and 4 rubber feet. The keyboard conversion kit can easily be mounted into the OTE AK enclosure. This enclosure is large enough to contain the ZX81/1000 computer and the full-size keyboard together. A handy label representing the ZX81/1000 keyboard layout is placed on the enclosure.

JE682-AK Keyboard Conversion Kit $99.95 ea.
(WITH OTE AK CASE - AS PICTURED)

JE682 Keyboard Conversion Kit $59.95 ea.
(WITHOUT OTE AK CASE)

80-Key Keyboard



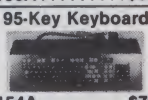
CA150C $69.95

84-Key Keyboard



CA153A $69.95

95-Key Keyboard



CA154A $79.95

CONTROL DATA KEYBOARDS

Limited Quantities!

- ★ Parallel ASCII
- ★ SPST Switching
- ★ FTZ Shielded Base
- ★ N-Key Rollover
- ★ 128 Character ASCII
- ★ Non-Slip, Non-Glare Keycaps
- ★ CDC752 Terminal Keyboards
- ★ Attractive Case

These Control Data Keyboards consist of a base, cover, the keyboard assembly, and an interface cable. Color (case): Harvest gold and black. Color (keycaps): Black, blue, and red. Electrical requirements: +5V @ 600mA, -12V @ 50mA. Weight: 6 lbs. All units brand new in original boxes, specifications included.

Keytronics 90-Key Soft-Programmable Keyboard

WITH SECURITY KEYLOCK SWITCH

350 Available!

- RFI shielded
- Cursor controls
- Numeric keyboard
- 8-bit Parallel
- Capacitance keys
- 10 user-programmable keys
- Positive TTL Logic
- Size: 17"L x 8¼"W x 2¾"H

BRAND NEW!!



Made for Visual Technology, this keyboard features: a security keylock (includes two keys) to guard against unauthorized use; an 11-key numeric keypad; cursor controls; and 10 user-programmable keys. Electrical requirements: +5VDC. Color (case): White. Color (keycaps): Black. Complete with case, keyboard assembly, 40-inch interface cable, and schematics. Weight: 7 lbs.

Part No. KB270 $109.95 each



23"Lx5¼"Wx1-3/8"H

MICRO SWITCH 85-KEY KEYBOARD
Word Processing Keyboard, 26 Pin Edge Card Connection. Supply Voltage +5VDC. Main Keyboard is QWERTY. Additional Key Pads for Cursor and word processing functions.
Part No. 85SD18-1 $29.95 each



3"L x 3"W x 1½"H

HI-TEK 14-KEY NUMERIC KEYPAD
SPST switching. Charcoal grey keycaps. Mounted on printed circuit board.
Part No. K-14 $9.95 each



9¾"L x 4½"W x 1½"H

ALPS 29-KEY CALCULATOR KEYBOARD
Features one 8-position decimal select switch, one 3-position switch, and two 2-position switches, mechanical SPST switching, 22-pin edge card connection. Pin-out included.
Part No. KB29704D (Fits OTE-11 Enclosure) $4.95 each



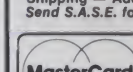
POWER SUPPLY +5VDC @ 1 AMP REGULATED *Transaction Tech*
Output +5VDC @ 1A (also +30VDC) reg. Input 115VAC 60Hz. 2-tone (black/beige) self-enclosed case. 6 ft., 3 cond. black power cord. 6½"W x 7"D x 2¾"H. Wt. 3 lbs. Data sheet incl.
Part No. PS51194S $14.95 each



POWER SUPPLY +5VDC @ 3 AMP REGULATED *Deltron*
Input: 115VAC, 47-440Hz. Output: 5VDC Adjustable @ 3 amp, 6VDC @ 2.5 amp. Adjustable current limit, Ripple & Noise: 1MV rms, 5MV p-p — 2 mounting surfaces. UL recognized. Size: 4"W x 4½"L x 2-7/16"H - wt. 2 lbs. Data sheet included.
Part No. QPS-1 $29.95 each



POWER SUPPLY +5VDC @ 7.5 AMP, 12VDC @ 1.5 AMP SWITCHING
Input: 115VAC, 50-60Hz @ 3 amp/230VAC, 50Hz @ 1.6 amp. Fan volt./power supply select switches (115/230VAC). Output: 5VDC @ 7.6 amp, 12VDC @ 1.6 amp. 8 ft. blk. pow. cord. 11½"W x 13¼"D x 3¾"H. Wt. 6 lbs.
Part No. PS94VDS $39.95 each



POWER SUPPLY 4-Channel Switching - Apple Compatible
Microprocessor, mini-computer, terminal, medical equipment and process control applications. Input: 90-130VAC 47-440Hz. Output: +5VDC @ 5A, -5VDC @ 1A; +12VDC @ 1A, -12VDC @ 1A. Line reg.: ±0.2%. Ripple: 30mV p-p. Load reg.: ±1%. Overcurrent protection. Adj: 5V main output ±10%. 6-3/8"L x 1-7/8"W x 4-15/16"H. Wt. 1½ lbs.
Part No. FCS-604A $69.95 each

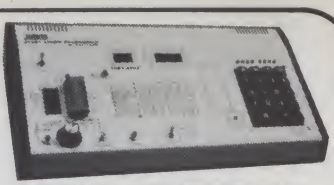
$10.00 Minimum Order — U.S. Funds Only
California Residents Add 6½% Sales Tax
Shipping — Add 5% plus $1.50 Insurance
Send S.A.S.E. for Monthly Sales Flyer!

Spec Sheets — 30¢ each
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Prices Subject to Change

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7/83 *PHONE ORDERS WELCOME — (415) 592-8097 Telex: 176043*



2708,2716,2732 & 2764 EPROM Programmer

JE664 EPROM PROGRAMMER

8K TO 64K EPROMS — 24 AND 28 PIN PACKAGES

— PROGRAMS 2716'S IN 16 SECONDS —

• Programs, validates, and checks for properly erased EPROMs • Emulates PROMs or EPROMs • RS232C Computer Interface for editing/program loading • Loads data into RAM by keyboard • Changes data in RAM by keyboard • Loads RAM from an EPROM • Compares EPROMs for content differences • Copies EPROMs • Power input: 115VAC, 60Hz, ◄ 10W power consumption • Enclosure: Color-coordinated, light tan panels w/molded mocha brown and pieces • Size: 15-5/8"L x 8¾"D x 3⅞"H • Wt.: 5¾ lbs.

JE664-A EPROM Programmer $995.00
Assembled & Tested (Includes JM16A Module)

JE665 — RS232C INTERFACE OPTION — The JE665 RS232C Interface Option implements computer access to the JE664's RAM. Sample software written in BASIC provided for TRS-80® Model I, Level II Computer. Baud rate: 9600. Word Lgth: 8 bits - odd parity. Stop bits: 2. Option may be adapted to other computers.

JE664-ARS EPROM Prog. w/JE665 Option $1195.00
Assembled and Tested (Includes JM16A Module)

EPROM JUMPER MODULES — The JE664's JUMPER MODULE (Personality Module) is a plug-in Module that pre-sets JE664 for proper programming pulses to the EPROM & configures EPROM socket connections for that particular EPROM.

Part No.	EPROM	EPROM MANUFACTURER	PRICE
JM08A	2708	AMD, Motorola, National, Intel, TI	$14.95
JM16A	2716,TMS2516	Intel, Motorola, National, NEC, TI	$14.95
JM16B	TMS2716	Motorola, TI (+5,-12, +12)	$14.95
JM32A	TMS2532	Motorola, TI	$14.95
JM32B	2732	AMD, Fujitsu, NEC, Hitachi, Intel	$14.95
JM32C	2732A(21V)	Fujitsu, Intel	$14.95
JM64A	MCM68764, MCM68L764	Motorola	$14.95
JM64B	2764	Intel	$14.95
JM64C	TMS2564	TI	$14.95
JM64D	HN482764G-4	Hitachi (21V)	$14.95

EXPAND YOUR MEMORY

TRS-80 to 16K, 32K, or 48K

**Model 1 = From 4K to 16K Requires (1) One Kit
Model 3 = From 4K to 48K Requires (3) Three Kits
Color = From 4K to 16K Requires (1) One Kit**

**Model 1 equipped with Expansion Board up to 48K Two Kits Required — One Kit Required for each 16K of Expansion —

TRS-16K3	*200ns for Color & Model III	$12.95
TRS-16K4	*250ns for Model I	$10.95

TRS-80 Color 32K or 64K Conversion Kit

Kit comes complete with 8 each 4164-2 (200ns) 64K dynamic RAMs and conversion documentation. Converts TRS-80 color computers with D and E circuit boards, and all new color computers to 32K. Minor modifications of 32K memory will allow the use of all 64K of the dynamic RAM providing you have a FLEX DOS operating system.

TRS-64K2 $54.95

IBM MEMORY EXPANSION KIT

SAVE HUNDREDS OF $$$ BY UPGRADING MEMORY BOARDS YOURSELF!

Most of the popular memory boards allow you to add an additional 64K, 128K, 192K, or 256K. The IBM64K Kit will populate these boards in 64K byte increments. The kit is simple to install — just insert the nine 64K RAM chips in the provided sockets and set the two groups of switches. Directions are included.

IBM64K (Nine 200ns 64K RAMs) $59.95

5¼" Mini-Floppy Disk Drive

Pertec Computer Corp.

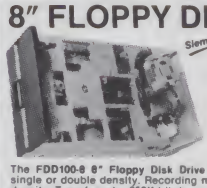


FOR TRS-80 MODEL I (Industry Standard)

Features single or double density. Recording mode: FM single, MFM double density. Power: +12VDC (±0.6V) 1.6A max., +5VDC (±0.25V) 0.8A max. Unit as pic. at right (does not incl. case, power supply, cables). 30-pg. data book incl. Wt. 3½ lbs. Size: 5¾"W x 8"D x 3¼"H.

Part No.	Limited Quantity!	Price
FD200	Single-sided, 40 tracks, 250K bytes capacity	$179.95
FD250	Double-sided, 36 tracks, 438K bytes capacity	$199.95

8" FLOPPY DISK DRIVE



- Shugart 801R compatible
- Single-Sided
- 77 Tracks
- 400/800K Bytes Capacity
- Industry Standard

The FDD100-8 8" Floppy Disk Drive (Industry Standard) features single or double density. Recording mode: FM single, MFM double density. Transfer rate: 250K bits/sec. single density; 500K bits/sec. double density. The FDD100-8 is designed to work with the single-sided soft sectored IBM Diskette I, or eq. disk cartridge. Power: 115VAC @ 50-60Hz, +24VDC @ 1.7 amps max., +5VDC @ 1.2 amps max. Unit as pictured above (does not include case, power supply, or cables). Size: 8.55"W x 14"L x 4.5"H. Weighs 12 lbs. Incl. 96-pg. manual.

Part No. Price

FDD100-8 . . $169.95 ea.

UV-EPROM Eraser

8 Chips — 51 Minutes



1 Chip — 37 Minutes

Erases 2708, 2716, 2732, 2764, 2516, 2532, 2564. Erases up to 8 chips within 51 minutes (1 chip in 37 minutes). Maintains constant exposure distance of one inch. Special conductive foam liner eliminates static build-up. Built-in safety lock to prevent UV exposure. Compact — only 9.00" x 3.70" x 2.60". Complete with holding tray for 8 chips.

DE-4 UV-EPROM Eraser $79.95
UVS-11EL Replacement Bulb $16.95

Circle 41 on Reader Service card

READER SERVICE

This card valid until August 31, 1983

My vote for the best advertisement in this issue goes to_____(company) whose Reader Service number is_____.

A. Which microcomputing systems *do* you own? Check all that apply.

- ☐1. Apple II, II +, III
- ☐2. Apple IIe
- ☐3. Atari 400, 800
- ☐4. Atari 1200 XL
- ☐5. Commodore VIC-20
- ☐6. Commodore-64
- ☐7. Commodore/PET
- ☐8. Cromemco
- ☐9. DEC
- ☐10. Franklin Ace
- ☐11. Heath/Zenith
- ☐12. Hewlett-Packard
- ☐13. IBM PC
- ☐14. Kaypro
- ☐15. NEC
- ☐16. North Star
- ☐17. Osborne
- ☐18. PMC 80/81
- ☐19. S-100 based system
- ☐20. Sanyo
- ☐21. Texas Instruments
- ☐22. Timex/Sinclair
- ☐23. TRS-80
- ☐24. Xerox
- ☐25. Other_____

Which of the following systems do you plan to buy during the next 12 months?

- ☐26. Apple Lisa
- ☐27. Apple IIe
- ☐28. Atari 1200 XL
- ☐29. Commodore-64
- ☐30. Compaq
- ☐31. Epson HX-20
- ☐32. Epson QX-10
- ☐33. Franklin Ace
- ☐34. Hyperion
- ☐35. IBM XT PC
- ☐36. Morrow Micro Decision
- ☐37. North Star Advantage
- ☐38. Osborne Executive
- ☐39. Otrona Attache
- ☐40. Panasonic JR-200
- ☐41. Sony SMC 70
- ☐42. Texas Instruments Compact
- ☐43. Texas Instruments Professional
- ☐44. Timex/Sinclair 2000
- ☐45. TRS-80 Model 12
- ☐46. TRS-80 Model 16
- ☐47. Tandy Model 100
- ☐48. Zenith 100
- ☐49. Zorba
- ☐50. Other_____

B. How much have you invested in computer hardware (including peripherals) during the last 12 months?

- ☐1. Nothing
- ☐2. Under $500
- ☐3. $500–$1,000
- ☐4. $1,000–$1,500
- ☐5. $1,500–$2,000
- ☐6. Over $2,000

C. How much do you plan to spend on computer hardware during the next 12 months?

- ☐1. Nothing
- ☐2. Under $500
- ☐3. $500–$1,000
- ☐4. $1,000–$1,500
- ☐5. $1,500–$2,000
- ☐6. Over $2,000

D. How much have you invested in computer software during the last 12 months?

- ☐1. Nothing
- ☐2. Less than $100
- ☐3. $100–$250
- ☐4. $250–$500
- ☐5. $500–$1,000
- ☐6. Over $1,000

E. How much do you plan to spend on software during the next 12 months?

- ☐1. Nothing
- ☐2. Less than $100
- ☐3. $100–$250
- ☐4. $250–$500
- ☐5. $500–$1,000
- ☐6. Over $1,000

F. Do you influence friends or business associates' purchases of computing equipment?

☐1. Yes ☐2. No

G. What do you consider the *best* source of information about computers? Check one only.

- ☐1. Computer magazines
- ☐2. Other magazines
- ☐3. Newspapers
- ☐4. Books
- ☐5. Seminars/courses
- ☐6. Word of mouth
- ☐7. Other_____

H. If you use a microcomputer at work, what is your primary application?

- ☐1. Word Processing
- ☐2. Database Management
- ☐3. Other Business
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1	6	11	16	21	126	131	136	141	146	251	256	261	266	271	376	381	386	391	396
2	7	12	17	22	127	132	137	142	147	252	257	262	267	272	377	382	387	392	397
3	8	13	18	23	128	133	138	143	148	253	258	263	268	273	378	383	388	393	398
4	9	14	19	24	129	134	139	144	149	254	259	264	269	274	379	384	389	394	399
5	10	15	20	25	130	135	140	145	150	255	260	265	270	275	380	385	390	395	400
26	31	36	41	46	151	156	161	166	171	276	281	286	291	296	401	406	411	416	421
27	32	37	42	47	152	157	162	167	172	277	282	287	292	297	402	407	412	417	422
28	33	38	43	48	153	158	163	168	173	278	283	288	293	298	403	408	413	418	423
29	34	39	44	49	154	159	164	169	174	279	284	289	294	299	404	409	414	419	424
30	35	40	45	50	155	160	165	170	175	280	285	290	295	300	405	410	415	420	425
51	56	61	66	71	176	181	186	191	196	301	306	311	316	321	426	431	436	441	446
52	57	62	67	72	177	182	187	192	197	302	307	312	317	322	427	432	437	442	447
53	58	63	68	73	178	183	188	193	198	303	308	313	318	323	428	433	438	443	448
54	59	64	69	74	179	184	189	194	199	304	309	314	319	324	429	434	439	444	449
55	60	65	70	75	180	185	190	195	200	305	310	315	320	325	430	435	440	445	450
76	81	86	91	96	201	206	211	216	221	326	331	336	341	346	451	456	461	466	471
77	82	87	92	97	202	207	212	217	222	327	332	337	342	347	452	457	462	467	472
78	83	88	93	98	203	208	213	218	223	328	333	338	343	348	453	458	463	468	473
79	84	89	94	99	204	209	214	219	224	329	334	339	344	349	454	459	464	469	474
80	85	90	95	100	205	210	215	220	225	330	335	340	345	350	455	460	465	470	475
101	106	111	116	121	226	231	236	241	246	351	356	361	366	371	476	481	486	491	496
102	107	112	117	122	227	232	237	242	247	352	357	362	367	372	477	482	487	492	497
103	108	113	118	123	228	233	238	243	248	353	358	363	368	373	478	483	488	493	498
104	109	114	119	124	229	234	239	244	249	354	359	364	369	374	479	484	489	494	499
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273	ABC Data Products	130
401	Adventure International	118
109	Alcor Systems	CIII
491	Alphacom, Inc.	136
45	Ampersand Electronics	103
76	Apropos Technology	28
17	Arbutus Totalsoft, Inc.	43
402	Astro-Graphics Services	118
490	Axiom Corp.	135
269	B.G. Micro	109
131	Bay Technical Associates	23
403	Beaman Porter	119
326	Bourbon Street Press	84
404	Broderbund Software	119
405	Business Information Technologies	118
396	Bytek Computer Systems	85
489	Bytesize Micro Technology	138
262	Cab-Tek, Inc	95
369	Cardco, Inc.	11
275	Cer-Tek	143
283	CGRS Microtech	43
170	Chips & Dale	41
182	Components Express	33
121	Compucable Corp.	5
90	Compucover	143
466	Compumax	118
371	*Compuserve*	9
475	CompuTech	133
•	Computer Continuum	82
•	Computer Continuum	135
18	Computer Design Labs	27
25	Computer Entrepreneur Pub. Co.	123
473	Computer Marketing Services, Inc.	133
36	Computer Shopper	143
57	Computing!	97
407	Computing!	118
297	Concord Comp. Products	108
197	Cornucopia Software	99
252	Cuesta Systems	40
408	Cybertronics International, Inc	118
463	D. Lipinski Software	130
462	DAB Systems	133
471	DEG Software	133
293	D & N Micro Products	55
166	Data Mail	93
7	Datasouth	139
24	Data Systems	99
72	Data Tek	73
33	Designer Software	21
409	Digital Concept Systems Software	119
466	Digital Marketing Corporation	128
•	Digital Research Computers	106, 107
250	Discount Software Group	67
217	Eagle Computer Forms, Inc.	CII
60	Eastern House Software	73
87	Eco-Tech	137
410	Edu-Ware Services, Inc.	119
169	Elcomp Publishing, Inc.	13
93	Electronic Specialists, Inc	133
192	Ellis Computing	83
494	EMRI Computer	134
78	Expotek	7
230	Farwest	95
460	FlowerSoft	132
206	Fort Worth Computers	25
59	Franklin Computer	75
194	French Silk Smoothware	18
261	GTEK Corp.	127
481	Gavilan Computer Corp.	137
322	Gladstone Electronics	22
107	Grout and Associates	92
251	Holmes Engineering	127
411	Human Engineered Software	119
412	Human Engineered Software	119
38	ISE	39
469	Industrial Consultant	130
470	Infocom, Inc.	132
67	Innovative Data	49
128	Innovative Technology	143
•	**Instant Software, Inc.**	
	• Business Cycle Analysis	125
	• Sales Opportunity	121
	• Timex Sinclair Ad	37
465	Instant Software	128
345	International Software Alliance	92
84	JDR Microdevices	104, 105
342	J & L Software	143
92	JPC Products	85
•	JRT Systems	51
48	Jade Computer Products	110, 111
41	Jameco Electronics	114
246	Johnson & Johnson Computers	15
151	Just Woods, Inc.	14
222	Kalglo	22
288	Keystone Info. Products	54
209	L-Com	68
198	LNW Research	8
355	Leading Edge Products, Inc.	CIV
373	Logical Devices, Inc.	76
204	Lyben Computer Systems	103
249	MCE	19
316	MFJ Enterprises	34
115	Mechanix Illustrated	28
325	Mega Byte	143
382	Memorex	3
413	Microcom, Inc.	119
•	**Microcomputing**	
	• Dealers Sell	121
	• Foreign Dealers	143
	• New Microcomputing Subscription	35
	• Subscription Problems	143, 103
	• University Micros	82
414	Micro Lab	120
329	Micro Management Systems	141
343	Micro Mittens	24
34	Micro Peripherals Corp.	103
415	Microsoft Corp.	120
487	Microtech	134
464	Midwest Software Associates	128
480	Mouse Systems Corp.	138
350	Nat'l Ass'n of Freelance Programmers	40, 103
•	Netronics R & D, Ltd.	53
55	New England Business Service, Inc.	132
467	Oasis Systems	128
140	Omnitek Comp. Int'l, Inc.	76
159	Orange Plus	89
172	Pacific Exchanges	40, 143
416	PEARLsoft	120
266	Perry Computers	32
277	Priority One Elect	112, 113
461	Pro/Pac, Inc.	130
351	Prosoft	45
122	Quantum Data, Inc.	23
247	Raytronics	26
366	RKS Marketing	103
488	Rana Systems	134
375	Semi Disk Systems	59
359	Simpliway Products Co.	54
14	Sintec	62
417	Sir-tech Software	120
132	Sixty Eight Micro Journal	84
123	SLR Systems	14
418	Southwestern Data Systems	120
361	Star Micronics	17
484	Strobe Graphics Systems, Inc	135
244	Sun Research	79
39	Sunlock Systems	24
419	Synapse Software	119
420	Synergistic Software	120
492	Suntest	137
341	TMSI	36
189	Tab Sales Company	87
421	Taurus Software	120
145	Teleprint, Inc	54
334	Trigon	94
472	United Microware Industries, Inc.	128
482	USI Computer Products	134
53	Upwego	32
214	Vandata	29
493	VR Data	138
•	**Wayne Green, Inc.**	
	• Binders	84
	• Book Nook 1	116
	• Book Nook 2	117
	• Inside Your Computer	91
	• Manuscript Ad	121
	• Nanos Cards	145
	• Selectric Interface	127
	• Shelf Boxes	121
	• Wayne Green Books	131
163	Wintek Corp.	82
486	World Electronics	136
311	York 10 Computerware	136
483	Zenith Data Systems Corp.	135

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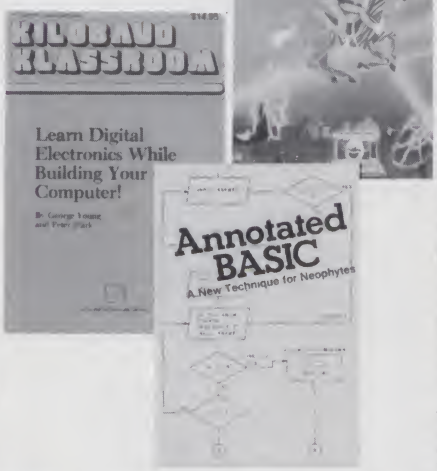
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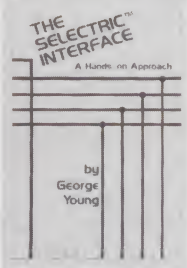


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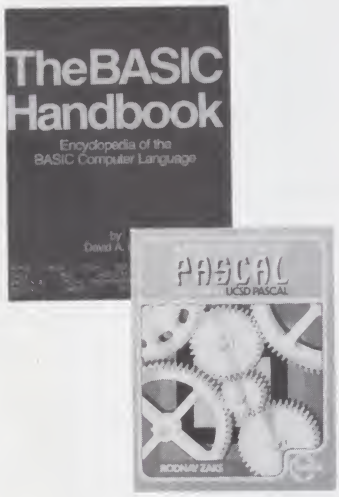
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Z-80 ASSEMBLY LANGUAGE PROGRAMMING—by Lance A. Leventhal. This book thoroughly covers the Z-80 instruction set, abounding in simple programming examples illustrating software development concepts and actual assembly language usage. Features include Z-80 I/O devices and interfacing methods, assembler conventions, and comparisons with 8080A/8085 instruction sets and interrupt structure. BK1177 $16.99.*

68000/6809

68000 MICROPROCESSOR HANDBOOK—By Gerry Kane. Whether you're currently using the 68000, planning to use it, or simply curious about one of the newest and most powerful microprocessors, this handbook has all the answers. A clear presentation of signal conversions, timing diagram conventions, functional logic, three different instruction set tables, exception processing, and family support devices provides more information about the 68000 than the manufacturer's data sheets. A stand alone reference book which can also be used as a supplement to *An Introduction to Microcomputers: Vol. 2—Some Real Microprocessors.* BK1216 $9.95

68000 ASSEMBLY LANGUAGE PROGRAMMING—by Gerry Kane, et al. A straightforward self teaching text book on assembly language programming for the 68000 microprocessor. This book contains the entire instruction set, describes the function of assemblers and assembly instructions and discusses basic software development concepts. A large number of practical programming examples are included. BK1233 $16.99

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Micro Software Digest

Compiled by Swain Pratt

Micro Software Digest presents capsulized software reviews from various computer-related publications.

CRIS (Cash Register Inventory System)

System Requirements: Atari 400/800; 32K RAM; printer recommended
Manufacturer: Adventure International, PO Box 3435, Longwood, FL 32750
Price: $249.95
Comments: "CRIS is a disk-based program," says the review, "that turns any Atari computer into a combination cash register (without the cash drawer) and inventory-management system for small retail businesses."

Outside of a limited invoicing capacity, CRIS has many useful features and is easy to use. "For the business that doesn't experience much customer traffic," concludes the review, "CRIS should more than fill the bill." Reader Service number 401

(Reviewed in Popular Computing, *April 1983)*

The Forms Designer

System Requirements: IBM PC; PC DOS; 128K RAM minimum
Manufacturer: Business Information Technologies Software, 1048 Nicklaus Ave., Milpitas, CA 95035
Price: $175
Comments: "The Forms Designer," states the review, "is a programmer's utility. . . . It allows programmers to write data-entry modules, with extensive screen formatting and error-trapping, quickly and effectively."

Although requiring practice to gain proficiency, the package has good documentation, and, concludes the review, "it should prove to be a cost-effective tool for harried application writers." Reader Service number 405

(Reviewed in InfoWorld, *March 28, 1983)*

Microteach Teacher's Aide

System Requirements: Atari 400/800; 48K RAM; two disk drives; TV
Manufacturer: Compumax, PO Box 1139, Palo Alto, CA 94301
Price: $195
Comments: According to the review, this program "is a welcome solution to the problem of tailoring computer-assisted education. With this program, a teacher with no knowledge of computer languages can create computer-based lessons that deal specifically with a particular curriculum."

The program simplifies test and grade management, keeps detailed records of student performance, and, states the review, "With a little imagination and creative endeavor, a teacher can use the keyboard graphics characters with pleasing results." Reader Service number 406

(Reviewed in COMPUTE!, *May 1983)*

Power

System Requirements: 8080, 8085 or Z-80 computer with CP/M
Manufacturer: Computing!, 2519 Greenwich St., San Francisco, CA 94123
Price: $169
Comments: Power is an auxiliary program designed to work with CP/M and make it easier to use. According to the review, "Power is useful for both experienced programmers and for the beginner. There are about 50 different commands that range from monitor functions to more common housekeeping operations."

The review concludes that "Power is a powerful program that does many things very well. It is relatively inexpensive and requires no complicated installation procedure." Reader Service number 407

(Reviewed in Interface Age, *April 1983)*

Astro-Scope

System Requirements: Apple II, TRS-80 Models I and III, IBM PC, Osborne I and all CP/M-compatible computers with 48K RAM; one disk drive
Manufacturer: Astro-Graphics Services, PO Box 28, Orleans, MA 02653
Price: Screen-only version: $30
Comments: According to the review, *this is an astrological program* that "on the basis of birth time, date and place, spews out 1500 to 1800 words of text explaining the birth chart."

Astro-Scope clearly offers entertainment value and precise calculations of celestial configurations, but is inevitably weak, states the review, in that "the generalizations offered are too imprecise to form the basis for decisive action or useful insight." Reader Service number 402

(Reviewed in Popular Computing, *April 1983)*

CyberLogo Turtle

System Requirements: Apple II Plus (versions available for other computers); DOS 3.3; 48K RAM; one disk drive
Manufacturer: Cybertronics International, Inc., Software Publishing Division, 999 Mount Kemble Ave., Morristown, NJ 07960
Price: $99.95
Comments: The reviewer states that this program is one of the best turtle graphics programs he has tried. "It carries out all of the normal turtle graphics functions smoothly and quickly," says the review.

The manual is a disappointment, but, concludes the review, "The CyberLogo program provides a very good and affordable implementation of turtle graphics that generally works well and that can be an extremely valuable learning tool for any person." Reader Service number 408

(Reviewed in Classroom Computer News, *April 1983)*

PowerText

System Requirements: IBM PC; 64K RAM; one or two disk drives; compatible printer
Manufacturer: Beaman Porter, Pleasant Ridge Road, Harrison, NY 10528
Price: $399 ($199 version available for users who already have the UCSD p-System)
Comments: "PowerText is a sophisticated, powerful program that invites comparison with the best available word processors," says the review, which then proceeds to match it with WordStar. The review states that in many ways the programs do the same things well, but with different design philosophies: WordStar is screen-oriented (you get what you see), whereas PowerText is not.

The review cautions that PowerText has limited compatibility because it is written in the UCSD p-System, but the disk includes a runtime version of the p-System, so you can run the program from DOS. The review concludes that PowerText "is beautifully tailored for high-volume production of documents that have strict format requirements." Reader Service number 403

(Reviewed in Softalk for the IBM Personal Computer, *January 1983)*

Bank Street Writer

System Requirements: Apple II, II Plus or IIe; 48K RAM; ROM Applesoft; one or two disk drives; printer
Manufacturer: Broderbund Software, 1938 Fourth St., San Rafael, CA 94901
Price: $69.95
Comments: "Bank Street Writer," says the review, "provides general word processing capabilities in a simple, uncomplicated program that just about anyone can have up and running in less than ten minutes, and it does it at a very low price."

It doesn't perform sophisticated operations, but it is good, according to the review, for straightforward text or letter writing. Reader Service number 404

(Reviewed in Softalk, *February 1983)*

Filemanager +

System Requirements: Atari 400/800; 40K RAM; two disk drives
Manufacturer: Synapse Software, 5327 Jacuzzi St., Suite I, Richmond, CA 94804
Price: $99.95
Comments: "If you keep track of extensive files and data, then this program is definitely for you," says the review. Filemanager is menu-driven, the various options enabling you to create and modify forms, enter data on forms or into files, and copy, delete or rename files.

"A clearly written, step-by-step instruction book," states the review, "puts the beginner at ease. . . . For all of its power, Filemanager + is remarkably easy to use." Reader Service number 419

(Reviewed in SoftSide, *#39)*

Basic Guitar 1

System Requirements: Apple II or II Plus; DOS with Applesoft in ROM; 48K RAM; one disk drive
Manufacturer: Digital Concept Systems Software, 4826 Bucknell, San Antonio, TX 78249
Price: $49.95
Comments: "Basic Guitar 1," says the review, "is a tutorial program designed for the humble beginner . . . or someone who wants to improve his or her playing."

According to the review, the program has an excellent manual, and the only thing missing "is talent. That peripheral is one the user must supply. Basic Guitar 1 is an example of a novel tutorial-software program; may its tribe increase." Reader Service number 409

(Reviewed in InfoWorld, *January 24, 1983)*

Hescount

System Requirements: Any version of Commodore PET/CBM or VIC
Manufacturer: Human Engineered Software, 71 Park Lane, Brisbane, CA 94005
Price: $23.95 (tape); $26.95 (disk)
Comments: Hescount is a Basic program profiler, a utility that monitors a program and counts the number of times each statement is executed. "This information," says the review, "can be used in a number of ways to assist in the development of a new program or the modification of an old one."

Simple to use, and with good documentation, "Hescount," concludes the review, "is a good program to add to your software development toolkit." Reader Service number 411

(Reviewed in COMPUTE!, *May 1983)*

VIC Forth

System Requirements: Commodore VIC-20; any RAM except 3K expansion cartridge
Manufacturer: Human Engineered Software, 71 Park Lane, Brisbane, CA 94005
Price: $59.95
Comments: "VIC Forth," says the review, "is a cartridge that contains an implementation of FIG-Forth . . . unique extensions allow the system to control color and sound features of the machine." The review states that while Forth expands the VIC-20's programming capacity, a beginner must have an introductory text on FORTH, such as *Starting Forth*, by Leo Brodie.

"With VIC Forth," concludes the review, "you just plug in the cartridge and everything is there . . . this is a good beginner's Forth system with innovative editor features." Reader Service number 412

(Reviewed in InfoWorld, *March 28, 1983)*

Micro/Courier

System Requirements: Apple II; 48K RAM; Applesoft Basic; one disk drive using DOS 3.3; a monitor or TV; Hayes Micromodem II; (other versions available for Apple III and IBM PC)
Manufacturer: Microcom, Inc., 1400A Providence Highway, Norwood, MA 02062
Price: $150
Comments: This program is for use between identical microcomputers, states the review; it "automatically transmits any kind of file or program the computer can produce." It also includes a terminal-mode option for communication with commercial timesharing systems.

Micro/Courier has a clear and comprehensive manual, according to the review, and its "operation is very straightforward and easy for a nontechnical person to master." Reader Service number 413

(Reviewed in Popular Computing, *February 1983)*

Statistics 3.0

System Requirements: Apple II; 48K RAM; Applesoft
Manufacturer: Edu-Ware Services, Inc., 22222 Sherman Way, Canoga Park, CA 91303
Price: $29.95
Comments: Statistics is a package that can handle a number of standard statistical data-organizing and analyzing procedures. The review states that "this is a fine program for someone who wants something more than a programmable calculator, but something less than an IBM mainframe."

"Despite limited documentation," concludes the review, "Statistics 3.0 is user-friendly. And best of all, the whole package does what it's supposed to do—calculate statistics accurately." Reader Service number 410

(Reviewed in BYTE, *October 1982)*

Personal PEARL, Version 1.04

System Requirements: Z-80 or 8080-based microprocessor; CP/M 2.2; 48K RAM; two single-sided, single-density, 8-inch disk drives; 80-column printer
Manufacturer: PEARLsoft, Division of Relational Systems Corp., 864 Promontory Place SE, Salem, OR 97303
Price: $295
Comments: This program is a complete information manager, states the review, which "allows you to organize your information, enter data into your files and generate various reports. The beauty of the program is its unusually easy-to-use design."

With excellent documentation and support, the review concludes, "This program contains features . . . that should make it a joy for any but the most sophisticated, demanding, large-system user to use." Reader Service number 416

(Reviewed in InfoWorld, *March 28, 1983)*

Wizardry

System Requirements: IBM PC; 64K RAM; two disk drives; color adapter
Manufacturer: Sir-tech Software, 6 Main St., Ogdensburg, NY 13669
Price: $59.95
Comments: IBM PC users will now have a version of Wizardry, one of the all-time bestselling adventure programs for the Apple. "Don't boot up Wizardry," says the review, "expecting to play an adventure like Zork. It has a lot more in common with role-playing games like Dungeons and Dragons."

The game, according to the review, "runs faster on the IBM (than on the Apple) and the graphics have been improved. This game may seem impossibly complex at first, but you will quickly learn why it has become a favorite." Reader Service number 417

(Reviewed in Softalk for the IBM Personal Computer, *January 1983)*

Multiplan

(Version 1.04 for the IBM PC)

System Requirements: IBM PC; PC DOS; 64K RAM (minimum); one disk drive (dual 320K drives preferred); black and white or color monitor; IBM-supported printer; (Note: other versions available for other computers)
Manufacturer: Microsoft Corp., 10700 Northup Way, Bellevue, WA 98004
Price: $275
Comments: Multiplan, according to the review, is a thoroughly capable spreadsheet that can run on CP/M-based machines and on Apple II with DOS, IBM PC and Fortune 16:32. It has the usual features of most spreadsheets, such as built-in commands for mathematical computations, many business-related abilities, an iteration command, and so on.

Multiplan is well designed to handle the tasks of modifying or restructuring your current data, and, concludes the review, it "is a superior product that Microsoft is sure to support well." Reader Service number 415

(Reviewed in InfoWorld, *March 28, 1983)*

The Learning System

System Requirements: Apple II; 48K RAM; one disk drive
Manufacturer: Micro Lab, 2310 Skokie Valley Road, Highland Park, IL 60035
Price: $150
Comments: "The Learning System," states the review, "is a test-generating program intended to help instructors provide automated testing for a wide range of learners The program is ingenious, user-friendly and well put together."

The program is not designed to develop sophisticated computer-assisted instruction, but, concludes the review, "If you regularly make use of short-answer tests . . . The Learning System may be right for you." Reader Service number 414

(Reviewed in Popular Computing, *April 1983)*

Global Program Line Editor

System Requirements: Apple II or II Plus; 48K RAM; DOS 3.3; one disk drive
Manufacturer: Synergistic Software, 830 N. Riverside Drive, Suite 201, Renton, WA 98055
Price: $65
Comments: "Global Program Line Editor," says the review, "is a more sophisticated version of the extremely popular Program Line Editor . . . the major addition to the program is the global editing capability."

"G.P.L.E. is a must for any serious Applesoft or Integer Basic programmer," concludes the review. "It decreases the amount of time and effort spent debugging and/or modifying your programs significantly." Reader Service number 420

(Reviewed in SoftSide, *#39)*

CP +

System Requirements: Nearly any microcomputer with CP/M and two disk drives
Manufacturer: Taurus Software, 870 Market St., San Francisco, CA 94102
Price: $150
Comments: Designed for those with little computer experience, CP + is, according to the review, "a simplified interface between the user and the CP/M operating system. The program allows you to easily select and run CP/M programs, perform a variety of print functions and manage files."

"CP + also fits into an office environment," the review concludes, "where computer users depend on complete applications . . . and would find it difficult to remember a sequence of CP/M commands." Reader Service number 421

(Reviewed in Interface Age, *April 1983)*

P-Term

System Requirements: Apple II Plus; Apple Pascal; 64K RAM; Disk Drive II; modem required; printer and 80-column card optional
Manufacturer: Southwestern Data Systems, 10761 East Woodside Ave., Santee, CA 92071
Price: $129.95
Comments: According to the review, P-Term is an Apple Pascal communications program that "turns your Apple into an 'intelligent terminal' that provides you with more flexibility. With the right modem, you can automatically dial and log into a variety of remote computers with a few keystrokes."

The review states that the program supports all 80-column boards compatible with Apple Pascal, and concludes "that P-Term is a well-designed package that meets its intended purpose with speed, accuracy and versatility." Reader Service number 418

(Reviewed in InfoWorld, *March 28, 1983)*

BYTE Publications, Inc., 70 Main St., Peterborough, NH 03458.

Classroom Computer News, published by Intentional Educations, Inc., 341 Mt. Auburn St., Watertown, MA 02172.

COMPUTE!, published by Small System Services, Inc., PO Box 5406, Greensboro, NC 27403.

InfoWorld, published by Popular Computing, Inc., 375 Cochituate Road, Box 880, Framingham, MA 01701.

Interface Age, published by McPheters, Wolfe and Jones, 16704 Marquardt Ave., Cerritos, CA 90701.

Popular Computing, published by BYTE Publications, Inc., 70 Main St., Peterborough, NH 03458.

Softalk and *Softalk for the IBM Personal Computer*, 11160 McCormick St., North Hollywood, CA 91601.

Softside, 6 South St., Milford, NH 03055.

Table. Addresses of the magazines publishing the software reviews digested in this department.

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Farmington, MI

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Milford, NH

SAGE 68000 microcomputer authorized dealer. Service, custom programming, consultation, terminals, printers, etc. Write for special low, low prices. You'll be glad you did! **New Castle Electronics, 100 Christian Hill Road, #3, Milford, NH 03055. 673-2806 or 673-9667.**

Aurora, IL

Full line of Apple Computer and Fortune Computer, Hewlett-Packard Personal Computers, Calculators and Supplies. IDS Prism, SMC and Daisywriter Printers. **Farnsworth Computer Center, 1891 North Farnsworth Ave., Aurora, IL 60505 (851-3888) and 383 East North Ave., Villa Park, IL 60181 (833-7100).**

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Used Heath H-8, S-100 BUS, and Wang Laboratories computer for sale. Memory board, I/O card, terminal, disk drive, software and complete system. Ten to 50 percent off list price. Send for free listing. D. Wong, Box 406, Croton Falls, NY 10519.

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For Sale: OSI C24P, 77 vint, Exc. Cond. (500cpu/RS-232,540 vid bd/No gphs, 542 keybd) Plus all Doc & 2yrs AARD. TECH JOURN. $450 or best offer. Call Roy Milano 914-937-1289.

Heathkit H-8 computer, 16K, H-19 terminal, serial/cassette board, cassette software, 1 year old. $750. Ron Campbell, 412 Woodley Rd, Savannah, GA 31406 912-925-6524.

Timex/Sinclair users: Write for information concerning the Z-WEST (SDTSUG) newsletter publication. SASE or stamp appreciated. SDTSUG/Z-WEST, PO Box 2411, Vista, CA 92083.

CLUB NOTES

Portland Computer Society

The Portland (OR) Computer Society ordinarily meets the third Saturday of each month in Room STB-14 in the Sylvania campus of Portland Community College, at 1 p.m.

For more information on membership, meetings or other matters, call Percy Wood, Newsletter Editor, at 503-289-8263 (nights), or 503-255-1841 (days).

Orange County Club—CA

The North Orange County Computer Club (PO Box 3616, Orange, CA 92665) normally holds its general meeting on the first Sunday of the month (*second* Sunday in July and September, 1983) in Hashinger Auditorium at Chapman College, beginning at 1 p.m.

For information, telephone Bob Dailey, Secretary and Newsletter Editor, at 213-696-0145.

Florida IBM PC User's Group

The Manasota IBM PC User's Group meets on the third Wednesday in Sarasota, FL. For details as to time and place, call the new president of the club, Richard Reynolds, 1102 Mallorca Drive, Bradenton, FL 33529; 813-792-5400.

NAMU

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American Software Club, Inc.

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For more information, contact Lee Konowe, American Software Club, Inc., Millwood, NY 10546; 914-762-5644.

Indiana-Michigan Osborne Group

The Michiana Osborne Users Group (MOUG) meets on the second Tuesday of each month at 7 p.m. in the branch office of the Valley Bank and Trust Company, in the Town and Country Shopping Center on West McKinley Ave., Mishawaka, IN.

For further information, contact Don Porter, 803 West Washington St., South Bend, IN 46601; 219-259-5411.



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BOOK REVIEWS

Edited by Larry Canale

Shedding Data Communication Ignorance
What Goes On Inside Micros?
Apple Graphics Made Easy
A Venture Into Apple VisiCalc
A Model Pascal Publication

Microcomputer Data Communication Systems

Frank J. Derfler, Jr.
Prentice-Hall, 1982
Englewood Cliffs, NJ 07362
Hardcover, 129 pp., $17.95
Softcover, $12.95

Since January 1980, Frank Derfler has held forth in the pages of *Microcomputing*, where his monthly column, "Overview" (formerly "Dial-up Directory") has served as a focal point for news on how microcomputerists are staying in touch electronically. And along with news, Frank has shared the basics of data communication and the products that make it tick.

Now, thanks to his latest book, *Microcomputer Data Communication Systems*, there is no need to dig through stacks of *Microcomputing* to reacquaint yourself with this information.

Don't get the wrong idea, though; this book is not just a rehash of Derfler's monthly magazine write-ups.

Written with the beginner in mind, *Microcomputer Data Communication Systems* teaches the basics and then gives you a start in applying them. Terms are carefully defined and concepts are illustrated through example. The result is highly readable material.

Weaknesses? With a little more than 100 pages (minus wide margins) and with its tables and figures, *Microcomputer Data Communication Systems* is more of an introduction than a complete treatment of the subject.

A second drawback is the book's lack of timeliness. Examples include the Radio Shack Model I, Apple II and S-100 systems. There is no direct exposure to TRS-80 Model III or IBM PC-compatible products.

If you're a loyal reader of "Dial-up Directory"/"Overview," then you may have outgrown a book like *Microcomputer Data Communication Systems*. On the other hand, if you still think "asynchronous" refers to a plumbing fixture and that "handshaking" belongs to politicians rather than computers, this book is a quick way to shed your ignorance.

Timothy Daniel
Oxford, OH

Understanding Computer Systems

Harold Lawson
Computer Science Press, 1982
11 Taft Court
Rockville, MD 20850
Paperback, 164 pp., $11.95

Understanding Computer Systems begins, innocently enough, with an explanation of processes and systems, processors and procedures, and data flow and interrupts—all illustrated by the familiar process of washing dishes (a crying baby is the high-priority interrupting process). Data channels and simplex, half- and full-duplex transmission are illustrated using the same example. System controls, error conditions and flow diagramming are also explained using the same simple example.

All of this shows that the activities going on inside every computer and program can be illustrated by simple, everyday examples we are all familiar with. The first five chapters of *Understanding Computer Systems* are devoted to this, and along the way the reader becomes familiar with all of the technical terms needed to understand computer hardware and software.

These terms are applied to the dishwashing task without detracting from their exact technical meanings, making technical terms easier to understand than in any presentation I have ever run across in any other computer book.

Beginning at chapter 6, the author leaves dishwashing behind and begins the "hard" discussions of processing in computer systems. With the vocabulary developed in the first part of the book, these topics become much easier to understand.

If there is any fault to be found with this book, it would involve the descriptions of computer hardware; they're short and superficial, and probably not what the average *Microcomputing* reader is looking for in a book with this title. The author's intent was to present the basic concepts and terminology of computer systems in an easy-to-read form aimed at college-level students and business professionals. He certainly has achieved these goals.

While I'm nit-picking, I might as well comment on the logic flow diagrams the author uses. He doesn't use standard symbols, and he has all parallel procedures and subroutines flowing down to a termination. These representations fall apart in examples where these procedures should be shown to return to the main branch of the process. This path is not at all obvious in this new type of flow chart.

Author Harold Lawson is a university professor (and some parts of the text read as though they *were* written by a professor) who draws on more than 25 years of practical experience in the computer industry. He's able to explain technical topics in a manner understandable to the rankest computer neophyte, providing the beginner with the vocabulary required for advancement into the ranks of computer professionals.

Since not everyone has advancement to professional status as an immediate goal, though, this may not be the best book for someone looking for a simple discussion of what is going on inside micros.

But if you want to get serious, and in particular, if you're about to start learning computer programming, *Understanding Computer Systems* will make your future studies much easier.

Ken Barbier
Borrego Springs, CA

Personal Graphics For Profit and Pleasure on The Apple II Plus Computer

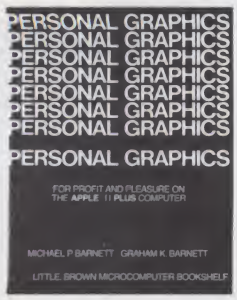
Michael P. Barnett
Graham K. Barnett
Little, Brown and Company, 1982
34 Beacon St.
Boston, MA 02106
Softcover, 192 pp., $14.50

My work as a corporate planner often requires me to generate graphics presentations to display the results of my department's analyses in a quickly understood manner.

Before my company bought Apples, this work was tedious. Now, with Apples and an HP plotter, we can generate graphs quickly.

Still, there are many times when off-the-shelf software doesn't quite do what we would like. Since I lacked the skills to readily design and write a graphics system, I started to scour the stores for a book to teach me the essentials of Apple II Graphics.

I found several graphics books, but many were too general in scope, and others were targeted at users of other computers. Finally, I found what I was searching for: *Personal Graphics*. Written in an easy-to-read style and laced with sample programs, this book leads the reader gradually from simple basics into an increasingly complex discussion of graphics applications.



By entering the programs listed along with the text, I soon was amazing myself with the Apple's ability to generate geometric images rapidly. (I got so fascinated at this stage that I had to set an alarm to remind me to go to bed!)

One of the strengths of *Personal Graphics* lies in the authors' elucidation of basic mathematical concepts. They explain equations for geometric shapes, along with the technique of breaking equations into expressions that can be evaluated quickly by plotting routines.

Starting first with the equation for circles, the authors then extend the equation to generate a variety of shapes. Even readers with disdain for mathematics soon will be watching cardioids, nephroids and limacons grow on the monitor screen.

Later chapters contain sample programs that permit the plotting of polynomials and that illustrate curve-fitting techniques. (I believe this book could be used in conjuction with a conventional high school text to instill both the excitment and beauty of math into the minds of students.)

Personal Graphics is an excellent buy for Apple owners interested in learning the basics of graphics.

The chapter titled "A Little Plotting and Scheming" prompted me to acquire *Personal Graphics* in the first place. It contains discussions of the conventional graphics tools for management: line graphs, bar charts and pie charts. The sample programs are useful and would be valuable to anyone not prepared to shell out the price of a commercial business graphics package.

While the intent of this book is to describe the creation of screen graphics, the techniques are applicable to plotting hardware.

If *Personal Graphics* has any faults, they're faults of omission. In several instances, the authors, having discussed basic techniques and having described illustrative programs, tempt the reader by suggesting a variation—without showing the reader how to accomplish the variation.

All in all, though, *Personal Graphics* is an excellent buy for Apple owners interested in learning the basics of graphics.

(The programs in *Personal Graphics* are available on disk and can be ordered from Tycon Corp., CN 5258, Princeton, NJ 08540, at $24.95 per disk.)

Justin Crom
Littleton, CO

The VisiCalc Book—Apple Edition

Donald H. Beil
Reston Publishing Co., 1982
11480 Sunset Hills Road
Reston, VA 22090
Hardcover, 301 pp., $21.95
Paperback, $14.95

Do your replication commands always work like you want them to? Do you ever use @Choose in your work? How about Move? @Max? @Min?

The VisiCalc Book—Apple Edition will help with those parts of a program you may not completely understand, and it adds enough information about some of the rarely used commands to help you incorporate them into your work.

I suspect that there are two types of VisiCalc users: those who take the time and effort to master the program, and those (like me) who read the manual, but

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really could use some extra examples to understand the more difficult parts of the program.

While we *expect* a book about VisiCalc to give us more information than the program manual, it's important to understand that that's a pretty difficult assignment. The VisiCalc manual has been praised for years as an outstanding example of software instruction, and for a book to improve on it is to ask an awful lot. But in two areas in particular, *The VisiCalc Book* does just that.

The first is in the number and quality of the examples it presents. Yes, when you buy *The VisiCalc Book*, you pay for much of the same information you already have in the VisiCalc manual. But this book takes almost everything a step further than simple instruction; it adds examples, and that's where it helps the reader gain a real understanding.

In fact, author Donald H. Beil opens with a simple budget forecast that's easy to grasp, but one that would take a lot of time to create by hand. Once you start to carry out this example for a few yearly periods, you see the capabilities of VisiCalc.

One unique idea Beil uses is to show an entire worksheet, along with just the sections of it that your screen displays, in larger letters, with lines that head back into the total worksheet, so you can see where your screen display comes from. This makes it easy to understand the total size of the worksheet you have available, as well as how to format it on your screen for the best results.

The book's second major strength lies in its detailed coverage of VisiCalc's commands and functions.

For instance, one truly strong area of this book is in its explanation of the replicate command. This is one of the more difficult parts of VisiCalc to grasp (at least for me), and Beil does an admirable job of getting across exactly what you can and cannot do with it.

He also has an excellent flowchart to show the difference in recalculating by row or by column.

Beil's analogy of a pile of 3×5 cards really helped me understand the move command. His advice to label things *after* you're done entering formulas, and *after* you format all your output, will save a lot of time.

For those with scientific minds, *The VisiCalc Book* explains functions like tangent, cosine, square root, arc cosine, and so on, while the VisiCalc manual merely lists them. @Choose and @Lookup and @Min and @Max are also covered more completely by Beil than they are in VisiCalc's program manual.

Beil's idea of creating templates is perhaps the highlight of his book.

"Templates," Beil writes, "are patterns or models that guide a person in entering data onto the electronic sheet." Once you have it designed, you can use it over and over. The same basic template would apply, for example, to an analysis of your electricity costs, your gas costs or your phone costs.

Beil gets a bit carried away with advice on how to design a VisiCalc template so anyone can use it without destroying anything. In actual use, I doubt you'd sit a secretary down and ask her to enter information.

On the flip side of this same coin, though, Beil gets a pat on the back for suggesting the use of blank templates to help gather data. These templates consist of printouts of the information you need, along with spaces:

Sales
Overhead Total
Number of Machines in Use
Labor/Hours

You print these up and use them to collect your data (here's where that untrained secretary is helpful) and then it's quick and easy to enter the information.

Of course, *The VisiCalc Book* isn't perfect; it's weak on ways to instruct your printer to do what you want. Beil laments that "Printers vary significantly in . . . the way in which we send information to them," and suggests that your "vendor" can help. (The VisiCalc manual isn't all that great on imparting this type of information, either.)

Another weakness is that, for some anachronistic reason, the book refers to storing data on tape, as well as on disk. My copy of VisiCalc doesn't even mention tape; does yours? A couple of typos and two hand-written additions are the only other faults I could find.

The VisiCalc manual unquestionably will teach you VisiCalc. But if you buy *The VisiCalc Book—Apple Edition*, expect to learn the program a bit faster, a trifle more easily and a shade more comprehensively. Expect to be more confident when you design a worksheet, and to use all of the capabilities of VisiCalc more fully.

VisiCalc is complex and powerful software whose value increases in direct proportion to your capabilities. If you use VisiCalc to any significant degree, Beil's book will more than pay for itself.

Gregory R. Glau
Prescott, AZ

Oh! Pascal!

Doug Cooper and Michael Claney
W.W. Norton and Co., 1982
500 5th Ave.
New York, NY 10110
Paperback, 476 pp., $17.95

A skilled actor could give the phrase "Oh! Pascal!" many different readings: delight, disgust, surprise, bewilderment, satisfaction . . . And any one of these expressions could be appropriate for the book *Oh! Pascal!*, depending upon the reader. Like most books, *Oh! Pascal!* is not a book for all reasons.

Specifically, *Oh! Pascal!* is an excellent text for an introductory college course in computer programming, or for a self-teaching aid to users already thoroughly familiar with another programming language. But it is not, and does not intend to be, a manual for individuals learning their first programming language on their own, and it is not a general-purpose reference work on the Pascal language.

Oh! Pascal! assumes that its readers know (or have a teacher who can tell them) about accessing a programming language through an operating system and about such concepts as input and output. In fact, one of the book's weaknesses is that it does not provide real examples of actual computer output (the examples in the text are a combination of typeset and typewritten simulated output).

But for its intended audience, *Oh! Pascal!* is a model publication. The content is sound and is presented in a light-hearted and often humorous way. The authors obviously are not worried about being 20th-century Moseses spreading Solemn Truth from ivy-covered Mount Academe. The writing style is clear and conversational, subliminally reassuring readers that the subject matter is not some nightmarish bogey-demon.

The emphasis is on problem-solving rather than on programming. The need for a concept is shown as the authors immediately present an interesting problem and show how a concept can be applied to that problem. Thus, for example, the need for looping is shown in a program that does long division.

The text is packed with examples, and readers are given intriguing programming problems to work on. (For about half of the problems, solutions are given in an appendix.)

The programming examples are at first difficult to follow because of typography—a combination of boldface, italic and regular typefaces and some highlighting with gray halftoning. But these examples stress solid programming approaches and emphasize structured programming throughout.

In addition, each of the 15 chapters ends with a practical section (often quite long) on "Antibugging and Debugging." (How nice not to have to learn all of this by trial and error!)

While *Oh! Pascal!* is comprehensive, it's technically incomplete. It reserves for an appendix brief discussions of goto, pack, unpack, page and label, as well as some other concepts.

Since the book is primarily a learning text and not a reference work, however, this isn't really a shortcoming. None of these features are essential, especially in structured programming, and the appendix provides an adequate introduction for students who might want to use them.

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Bloomfield Hills, MI

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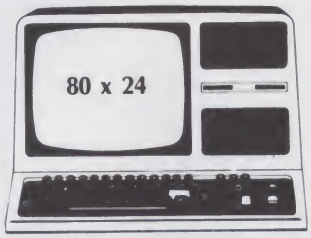
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NEW SOFTWARE

Edited by Dan Muse



VIC-20 owners get serious with the Wordcraft word processor.

A Crafty VIC-20 Word Processor

Wordcraft 20 is a word processing program that plugs into the Commodore VIC-20 just like any game or memory cartridge.

The program is designed to create perfect documents, correspondence and personalized form letters. It can create and print out mailing lists and other special-purpose projects. Wordcraft 20 makes use of the VIC's function keys and other special keys, offering a high degree of flexibility and versatility.

Special features of Wordcraft 20 include a page capacity of 66 lines of 99 characters; page width and length alteration at any time; new-page control, automatic line centering; justified or ragged margins, text highlighting, tab stops, decimal tabs, hard and soft hyphens; and display control. Up to 40 pages of text can be stored by the program on a cassette or disk.

Wordcraft also features automatic word wrap, eliminating broken words; paragraph merging to insert entire blocks of copy into previously typed text; and search and replace—a time- and effort-saving feature that lets you make a single change repeatedly throughout the text.

Wordcraft documents can be encrypted, so they will be unreadable to anyone without a special key code.

Wordcraft 20, which sells for $149.95, contains 16K of program on ROM chips. An additional 8K of RAM memory is in Wordcraft 20 Plus—priced at $199.95.

The Wordcraft 20 word processor is compatible with virtually any serial or parallel printer, including Commodore, Epson, NEC, Okidata and others.

Wordcraft 20 is manufactured by United Microware Industries, Inc., 3503-C Temple Ave., Pomona, CA 91768. Reader Service number 472.

Improve Your Punctuation

Punctuation & Style is a program designed to eliminate misused, redundant, faulty, cliché or erroneous phrases, and shows you how to improve them.

Punctuation & Style quickly marks and annotates your files for easy correction. It remembers sentences that you don't want to change and does not show them again in later checks.

The program is designed to catch many different types of errors, such as—

- Missing, extra or improper punctuation.
- Unbalanced quotes, parentheses or brackets.
- Improper abbreviations.
- Missing white space.
- Improper or missing capitalization.

Punctuation & Style is available for eight-inch CP/M-80, MP/M-80 and CDOS, Apple II with CP/M Softcard, the Osborne I, the Kaypro II, the NorthStar Horizon and Advantage, and SuperBrain with CP/M 2.2.

The software is manufactured by Oasis Systems, 2765 Reynard Way, San Diego, CA 92103. Reader Service number 467.

The HyperTyper

If you still use the hunt-and-peck technique of typing, HyperTyper may be for you.

HyperTyper is a program designed to help people acquire a skill which is a prerequisite to computer literacy—typing fluency. HyperTyper is designed to be used in the office, school or home.

HyperTyper is available for the IBM Personal Computer, Osborne and CP/M systems, including the Apple II.

The program costs $49.95 and is manufactured by Digital Marketing Corporation, 2363 Boulevard Circle, Suite 8, Walnut Creek, CA 94595. Reader Service number 466.

Decision-Making Aid

Business Cycle Analysis, from Instant Software (Route 101 & Elm Street, Peterborough, NH 03458), is designed to assist you in making critical planning decisions. The program summarizes cyclical and seasonal indices on an Apple Computer.

Business Cycle Analysis aids management decision-making regarding inventory control, investments, personnel increases and credit extensions.

Business Cycle Analysis is completely documented and fully guaranteed. It costs $59.95 and requires Applesoft, 48K and one disk drive. A printer is optional. Reader Service number 465.

Apple Word Processor

Write Away is a full-function word processing system for the Apple IIe or the Apple II with 48K. The program is designed to be used in home or commercial applications. It will utilize the features of any printer.

Included with Write Away is a mailmerge/form letter feature capable of handling conditional text. Also included are utilities that allow you to create mailing lists from popular databases for use with the mail-merge feature.

Write Away supports an array of formatting commands that allows for the creation of almost any document. The call command lets you construct a document of any length or a combination of standard paragraphs from a master control file. Multiple commands can be combined in a single macro command and executed locally or globally. Blocks of text can be moved or replicated quickly and easily.

Write Away requires 48K and one disk drive; however, systems which have 64K are able to take advantage of a feature which permits instant

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Microcomputing magazine, in conjunction with the Heath Company, manufacturers of the HERO 1, invites all HERO 1 programmers to submit their best applications to this contest. Entries will be judged in the following categories:

1. Standard HERO 1 with arm.
2. Modified HERO 1, including additional RAM or ROM, as well as any mechanical or electrical modifications.



Prizes will be awarded to the top three entrants in *each* category. Two $500 gift certificates (one from each category) will be awarded. Each first place winner will select the prizes of his choice, worth up to $500, from the latest Heath Company catalog. A $100 gift certificate, good toward any purchase from the Heath catalog, will be awarded to both second place winners. Third place winners from each category will receive a copy of Microcomputing columnist Mark Robillard's new book, "HERO 1 Advanced Programming and Interfacing," plus a one-year paid subscription to Microcomputing magazine.

CONTEST RULES

1. All programs must be submitted both on cassette tape and in hard copy form. A brief, written description of the application must accompany each entry.
2. Entries in the modified category must include a complete description of the alterations performed on the robot.
3. The contest is open to all HERO 1 owners, except employees of Wayne Green Inc. (publisher of Microcomputing), and the Heath Company and and their immediate families.
4. All entries, including programs, become the property of Microcomputing.
5. All entries must be received by Microcomputing by September 1, 1983.

Send submissions to:

Robotics Contest
Microcomputing
80 Pine Street
Peterborough, N.H. 03458

7. Contestants may submit more than one entry in one or both categories.

Entries will be judged on originality and technical feasibility. The more practical and easily adaptable the application, the better. Winners will be announced in the December 1983 issue of Microcomputing. So rev up your robot, and let's put the Heath's HERO through its paces!

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switching between the editing and formatting of programs. The program also recognizes all popular 80-column cards, without the need for a separate configuration routine.

Write Away costs $175. It is available from Midwest Software Associates, PO Box 301, St. Louis, MO 63074. Reader Service number 464.

Six Timex-Sinclair Programs

D. Lipinski Software (2737 Susquehanna Road, Roslyn, PA 19001) has released six programs for the Timex-Sinclair 1000 computer. The programs require 16K, but are self-expanding to available memory, or have instructions for modifying them to fit in any memory size.

The six programs are Tutor, List, Check, INEX, Stock and INVEN.

Tutor is a quiz-making program. You can tailor the quiz to your student. You may enter text and questions, or just questions, in multiple, true/false or direct answer formats. A subroutine to organize your inputs so they are readable when displayed is available.

List is a data-entry and retrieval program. You can list up to four categories and view, add, delete, print or mass search any information in any category. A 16K RAM will yield 150 entries with 8000 characters in the field.

Check is a checkbook program for 200–400 transactions. The program lists by item, name, date or check number either to the screen or the printer. Entry errors are correctable.

INEX is an income and expense-sheet style program for purchases, payment, interest, beginning balance and current balance for over 99 user accounts, including standard deductions, net pay and total income. The program also adds/deletes account names, lists to screen or printer, and transfers balances to set a new account period.

Stock is a program that keeps a count of items; adds; deletes; searches; and changes items by description, item number or category. A complete list can be sent to screen or printer.

INVEN is a total inventory program for quantity purchased or sold; balance on hand; cost; replacement costs; and accrued values. You can search or change items by description, category or stock number.

Tutor, List, Check, INEX, Stock and INVEN can be purchased for $10 each. Reader Service number 463.

TS Editor

PDS Editor is menu-driven software that allows you to create and edit Z-80 machine-language programs for use with the Timex-Sinclair 1000 computer.

PDS Editor contains modules to write, insert, move, store on cassette and list Z-80 machine code. Additional utilities inspect and modify system pointers and convert hex to decimal and decimal to hex. A subroutine, accessible in machine language, prints characters to screen without invoking Basic.

PDS Editor will let you write fast-executing programs that are useful for real-time control applications. The program comes on cassette. Its loading time is about three minutes. It requires 8K.

PDS Editor is manufactured by Industrial Consultant, 62 Montague St. #5A, Brooklyn, NY 11201. It costs $80. The documentation can be purchased separately for $20. A short data sheet is available for no charge. Reader Service number 469.

Controlling Your Printer

PRO/PAC's (14925 Memorial Drive, Suite 105, Houston, TX 77079) PCP (Printer Control Program) lets you set up your dot matrix printer to print in boldface type, compressed characters, variable line spacing, slashed zeros, elongated characters and other modes.

The program is designed to eliminate the need to enter long strings of printer control codes in order to change printing modes. PCP is completely menu-driven. The program will send printer control codes

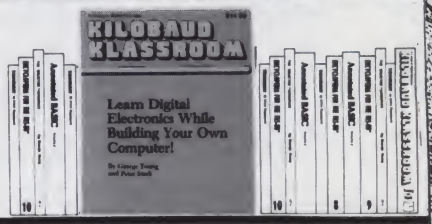
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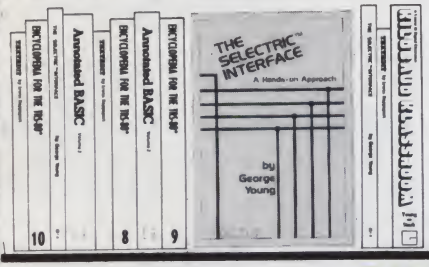
by George Young and Peter Stark

Makes learning electronics fun and easy. First published as a series in *Kilobaud Microcomputing*, the book combines the learning of essential theory with practical, hands-on experience. The course begins with basic electronic projects and culminates in the construction of your own programmable microcomputer. The direct instructional methods of authors Young & Stark make KILOBAUD KLASSROOM a simple way for you to acquire a solid background in digital electronics.

BK7386 (419 pages).....$14.95



THE SELECTRIC INTERFACE by George Young



You need the quality print that a daisy wheel printer provides but the thought of buying one makes your wallet wilt. The SELECTRIC™ INTERFACE, a step-by-step guide to interfacing an IBM Selectric I/O Writer to your microcomputer, will give you that quality at a fraction of the price. George Young, co-author of *Kilobaud Microcomputing* magazine's popular "Kilobaud Klassroom" series, offers a low-cost alternative to buying a daisy wheel printer. The SELECTRIC INTERFACE includes: step-by-step instructions, tips on purchasing a used Selectric, information on various Selectric models, including the 2740, 2980, and Dura 1041, driver software for Z80, 8080, and 6502 chips, tips on interfacing techniques. With The SELECTRIC INTERFACE and some background in electronics, you can have a high-quality, low-cost, letter-quality printer. Petals not included.

BK7388 (125 pages).....$12.97

TEXTEDIT

A Complete Word Processing System in Kit Form

by Irwin Rappaport

TEXTEDIT is an inexpensive word processor that can be adapted to suit your differing needs—from form letters to lengthy texts. Written in TRS-80 Disk BASIC, the system consists of several modules, permitting the loading and use of only those portions needed. A disk is also available which provides the direct loading of the modules, however, the book is required for documentation. For Model I and III with TRSDOS CONVERT., one disk drive (2 disk drives or copy utility needed to transfer to system disk). Runs under TRSDOS 2.2/2.3. May not function under other systems.

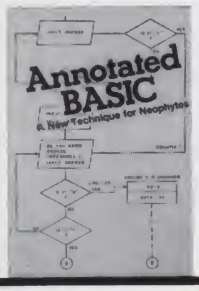
BK7387 (book, 90 pages).....$9.97
DS7387 (disk).....$19.97

Disk is manufactured by Instant Software, a division of Wayne Green Inc.



ANNOTATED BASIC

A New Technique for Neophytes



Put your BASIC knowledge to work for you with this 2-volume set of TRS-80 Level II BASIC programs. Gain a better understanding of the elements and techniques involved in programming. ANNOTATED BASIC'S uniquely designed format breaks each program down for you to include: initial documentation and instruction, definitions of New BASIC Concepts, flowchart, annotations of sections, showing how each part fits into the whole, and explaining why certain BASIC commands are chosen over similar ones.

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BK7384 (Vol. 1, 152 pages).....$10.95
BK7385 (Vol. 2, 136 pages).....$10.95

COMPUTER CARNIVAL by Richard Ramella

Your child can become a crackerjack computerist with the sixty TRS-80 Level II programs in COMPUTER CARNIVAL. This large-type, spiral bound book for beginners is a veritable funhouse of games, graphics, quizzes and puzzles. Written by *80 Micro* columnist Richard Ramella, the programs are challenging enough to ensure continued learning, yet short enough to provide your child with the immediate delight and reward of mastering basic computing skills. And for even greater enjoyment, get the CARNIVAL COMPANION, a 30-minute cassette containing all the programs in the book. Eliminates tiresome typing and lets your child spend more time enjoying the programs.

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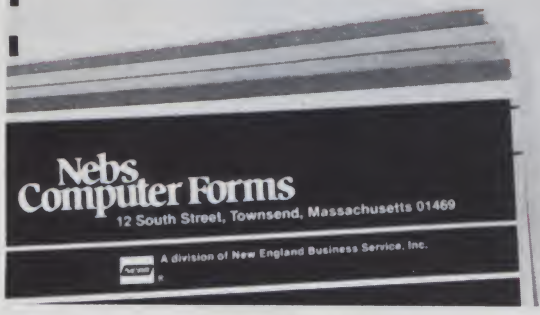
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Suspended is an interactive prose adventure game from Infocom, Inc. The science fiction game takes you into the twilight world of cryogenic suspension.

at the touch of a key.

PCP is now available for the new Apple Dot Matrix Printer, the Epson MX 80/100 Printers and the IBM Dot Matrix Printer. Computers supported by the system include the IBM Personal Computer, Apple II Plus, Apple III (in native mode) and the new Apple IIe.

PCP costs $24.95. Reader Service number 461.

A Nightmarish Game

Suspended is Infocom's (Infocom, Inc., 55 Wheeler St., Cambridge, MA 02138) second science fiction game. This game takes you into the "twilight world of cryogenic suspension and awakens [you] to the nightmarish landscape of a planet in its death throes."

Suspended features a functional game board and movable game pieces. These physical elements are designed to add an extra dimension to the game.

While attempting to save the planet, you are able to strategically manipulate six characters (robots), each having a different perception of the game environments, and each offering specific options. Suspended is designed to continually challenge you to perfect your strategies and develop new ones, as you will spend up to 30 hours solving the game's puzzles.

Suspended costs $49.95. Reader Service number 470.

Apple Database

The Data Bank is a versatile, multifunction database

management program that is designed to offer all the power and sophistication of high-priced database systems.

The Data Bank is menu-driven with interactive preselection for speed and ease. The program is "unlocked," allowing you to customize the program and providing the dependability of multiple backups. The use of standard files permits compatibility with other programs, such as VisiCalc and most word processors.

Features of The Data Bank include a versatile form generator for printing reports, mailing labels, checks, invoices or forms of your own design; global math functions; multilevel searches and sorts, plus a "fast find" concept that locates records in a matter of seconds; flexibility in changing, relocating and transferring data; the ability to create new files from existing data, and the capacity to handle large files.

The Data Bank costs $170 and requires an Apple II Plus or Apple IIe with Applesoft, 48K and at least one disk drive. It is manufactured by FlowerSoft, 564 Tara, Manteca, CA 95336. Reader Service number 460.

From One Apple To Another

MicroMover is a program designed to be used both by the novice and experienced computer user, whoever has a need to transfer files from one Apple II to another Apple using a modem.

Any type of file can be transferred without converting to text file first. A data compression algorithm cuts the transfer time. The disk-to-disk file transfer can be completed with a minimum of operator intervention.

The MicroMover program features one simple menu and one-character commands. One, some or all files on a disk may be transferred.

MicroMover works with either DOS 3.2 or 3.3. In fact, one system may be using 3.2 while the other is using 3.3.

The MicroMover works with the Hayes MicroModem II, acoustic modems and others. Only one copy of the program needs to be purchased, as MicroMover transfers a copy of itself to the distant end, if required.

MicroMover costs $50 and is manufactured by DAB Systems, 9116 Rockefeller Lane, Springfield, VA 22153. Reader Service number 462.

Shape Up!

DEG Software (11999 Katy Freeway, Suite 150, Houston, TX 77079) has announced the release of a personal diet and exercise program for use on the IBM Personal Computer. The product, called InShape, provides a method for recording detailed information on daily food intake and exercise performance. InShape has a computerized food dictionary and automatically calculates points for aerobic exercises.

Various plotting functions, including 60-day and 52-week summaries, are designed to give you an accurate picture of diet and exercise patterns over a period of time.

InShape's plotting capabilities allow you to plot any of four consumptions (protein, carbohydrate, calorie and fat) against food group, meal or body weight. Possible plots include calories consumed according to food group, protein consumed vs. body weight and so on.

InShape requires an IBM PC, a minimum of one disk drive and an 80-column monitor. A printer is optional. It is compatible with DOS 1.0 or 1.1 with 64K, or DOS 2.0 with 96K. It costs $95. Reader Service number 471.

C-64 on the Write Track

Computer Marketing Services, Inc. (300 W. Marlton Pike, Cherry Hill, NJ 08002), has released Script 64, a full-function word processing system for the Commodore-64.

The program has a built-in dictionary, which can be expanded to 20,000 words. In addition to all normal text editing functions, Script 64 has enhancements such as the ability to hold 40 screen pages (1000 characters each) in the computer at one time, which can be linked together for a document capacity of 999 screen pages; storage of deleted text in a buffer for recall in the same or different place; automatic page numbering, book fashion; header and trailers; redefinable keyboard; output to video with horizontal scrolling; and help screens.

Script 64 supports the Commodore 1541 disk drive and Commodore 1525 printer. Other serial or ASCII printers can be supported with an optional RS-232 interface. Script 64 also supports all other CBM disk drives and IEEE printers via an optional C-64 Link (also available from Computer Marketing Services, Inc., for $169.95). Script 64 costs $139.95. Reader Service number 473.

Learning Math Basics

The Math Teacher is an educational program designed to drill students on the basics of addition, subtraction, multiplication and division. It runs on the Commodore-64 system.

The program presents up to 25 problems per each working session. The student selects which of four math operations to perform. He also selects from four skill levels. At the end of the session, the student's score is displayed along with a reminder of the operation and level chosen.

The Math Teacher operates in full color, has graphics and is easy for children to use.

The program costs $39.95 and is available from Compu-Tech, PO Box 7000-309, Redondo Beach, CA 90277. Reader Service number 475.

In Case You Were Wondering . . .

In the May New Software section, we listed a product called PC/InterComm; however, we omitted the name and address of the manufacturer. The manufacturer is Mark of the Unicorn, PO Box 423, Arlington, MA 02174.

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NEW PRODUCTS

Edited by Dan Muse

Atari-Compatible Disk Drive

The Rana 1000 is an Atari-compatible floppy disk drive from Rana Systems (20620 South Leapwood Ave., Carson, CA 90746).

The Rana 1000 has single-density capacity and offers 90,000 letters of storage on a single disk. The product line also will include a double-density drive with 180,000 characters of storage.

In addition to the write-protect feature, which keeps stored information safe, the new drive offers an LED readout which displays the density storage, error status and drive number.

The Rana 1000 is 1/3 the size of the Atari drive. It costs $399. Reader Service number 488.

An Independent Mouse

OptoMouse, from USI Computer Products (A Division of USI International, 71 Park Lane, Brisbane, CA 94005), is a "smart" mouse, which comes equipped with an on-board microprocessor to provide accurate cursor positioning and graphics input. It is designed to be used with virtually any microprocessor system.

The OptoMouse is about the size of a cigarette pack. The mouse is moved back and forth over a reflective grid. This motion is then translated into a corresponding computer input and appears on the screen. It can be used to initiate action, to aid word processing or to draw graphics.



USI's OptoMouse 2000 comes with an on-board microprocessor and can be connected to virtually any microcomputer system.

The OptoMouse has its own on-board power supply and uses a standard RS-232 interface to connect to virtually any microcomputer.

The OptoMouse costs $179. A WordStar overlay that adapts the mouse to WordStar word processing applications is available for $49.95. Reader Service number 482.

C-64 Disk Drive

Microtech, Inc. (PO Box 102, Langhorne, PA 19047), has announced the PEDISK CII, a high-performance disk system for the Commodore-64. Available in single-or dual-drive versions, the PEDISK can accommodate three-inch, 5¼-inch or eight-inch disk drives.

The system consists of a controller circuit assembly, a cable and standard disk drives. The controller plugs into the expansion connector of the Commodore-64.

PEDISK CII features high-speed, IBM-CP/M compatibility, expandability and a simple, reliable design. PEDISK transfers data directly to the computer memory at a rate of 250,000 bits per second. The disk format is 3740. This allows disks to be exchanged with other computer brands, minis and mainframes.

PEDISK is supplied with the PDOS operating system software. It includes a full set of utilities and Basic commands. The single-drive 5¼-inch system is the model C540-1: it costs $595. The model C877-1 (single eight-inch system) costs $1095. Reader Service number 487.

Apple Keyboard Controller Card

Soft Stroke is a keyboard controller card for the Apple II. The nine- by three-inch card plugs into one of the Apple's I/O slots.

The Soft Stroke card lets you connect either the standard Apple II keyboard or an external seven- or eight-bit ASCII-encoded, parallel output keyboard.

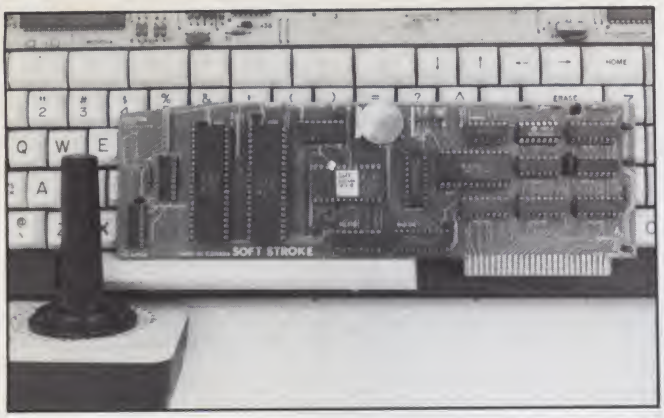
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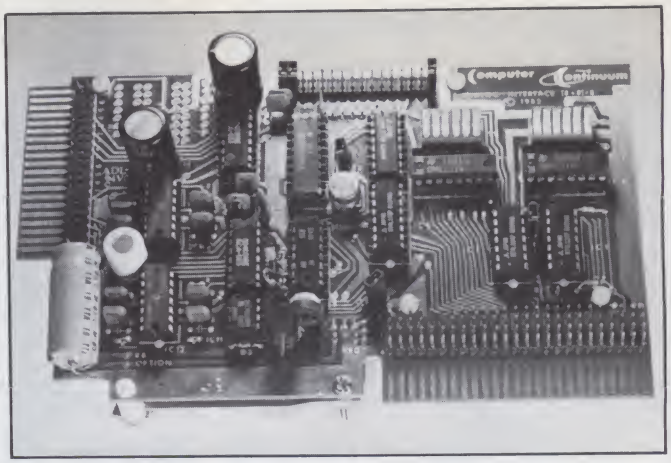
The Rana 1000, from Rana Systems, is an Atari-compatible disk drive.



The PEDISK CII is a high-performance disk drive system for the Commodore-64.



The Soft Stroke card, from Emri Computer, lets you connect either the standard Apple II keyboard or an external seven- or eight-bit ASCII-encoded, parallel output keyboard.



Computer Continuum's high-speed analog board is designed to open the door to the world of analog signal processing and control.

you adapt full-sized keyboards for operation with the Apple II computer. It allows redefinition or repositioning of any character-code generating key of the keyboard. Any key may be defined as a macro key. All keyboard translation parameters are stored in battery-packed CMOS RAM (2K).

Soft Stroke's on-board software includes a sophisticated keyswitch editor that allows disk storage and retrieval of keyboard definitions; keyboard definitions may be loaded from disk using three simple Basic commands.

Soft Stroke's operating system provides a 128K type-ahead buffer. The card is compatible with any operating system. There is a built-in real-time clock with 1/10 of a second resolution.

The Soft Stroke card costs $199, and is available from Emri Computer, PO Box 4878, Station E, Ottawa, Ontario, Canada K1S 5J1. Reader Service number 494.

Axiom's Printer

The Model EX1601 is a full-sized, high-speed printer that features permanent archival-quality printouts. It is manufactured by Axiom Corp., 1014 Griswold Ave., San Fernando, CA 91340.

The nonimpact, electrosensitive mechanism prints at three lines per second (up to 240 characters per second), and eliminates the need for ribbons, toners or chemicals.

The Model EX1601 prints the full 96-character ASCII set on standard 8½-inch wide paper with an additional 128 symbols and foreign language characters.

The printout is software-selectable for an 80-, 40- or 27-column format. Print sizes can be mixed on a line and reverse printing can be used for emphasis.



The Model EX1601, from Axiom Corp., is a high-speed printer with permanent archival-quality printouts.

A choice of standard parallel, RS-232C and 20mA serial, or IEEE-488 interfaces is available. The Model EX1601 costs $695. Reader Service number 490.

A Door-Opening Board

Computer Continuum's (301 16th Ave., San Francisco, CA 94118) high-speed analog interface board is designed to open the door to the world of analog signal processing and control. The board is available for several types of microcomputers.

A special set of pins at the connector to the host computer allows you to rearrange the pin assignment for easy interfacing.

The board works with the Timex-Sinclair 1000, Apple II, TRS-80, Commodore-64 and Z-80-CPU-type computers that have an appropriate user bus.

The board can plug directly into the TS-1000 to form a powerful dedicated system. The board has many on-board jumpers and switches that are designed to allow versatility in the areas of decoding addresses, memory or I/O mapping, control bus standards, power supplies, analog scales and A to D conversion modes.

The user's manual includes sample programs in Basic and machine code. The board costs $195, assembled and tested, with manual and connector parts. Contact the company directly for more information.

Two Monochrome Monitors

Two new compact monochrome video monitors, one with amber display and one with green, have been introduced by Zenith Data Systems Corp. (1000 Milwaukee Ave., Glenview, IL 60025). The 12-inch monitors are intended for use with a wide range of video games and personal computers.

Capable of a 25-line-by-80-character display, each unit is equipped with a 40-80 character switch to increase character size when the computer has a 40-column display. The green-screen model (ZVM-123) is priced at $149, while the amber-display model (ZVM-122) sells for $169. Reader Service number 483.

Graphics Plotter

The Strobe 200 is a graphics plotter that features a more efficient paper-loading system and an innovative pen holder that is designed to allow the use of a wide variety of pens. The Strobe 200 costs $795 and provides a spectrum of options.

One option is an on-board RS-232C serial interface used with MS-DOS, PC-DOS and CP/M. This option provides four built-in character sets for foreign languages. The languages are complete with both upper- and lowercase letters and can be used in any combination on a page. This option costs $195.

Other Strobe 200 options

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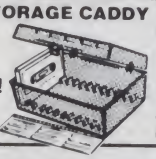


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are parallel interface cards that connect with a variety of personal and professional computers. The Apple-compatible interface is priced at $85; the Osborne interface costs $90; and the Commodore and TRS-80 interfaces cost $110 each.

Strobe Graphics Systems, Inc., 897-5A Independence Ave., Mountain View, CA 94043. Reader Service number 484.

Low-End Printer

Alphacom, Inc. (2323 South Bascom Ave., Campbell, CA 95008), has introduced a low-cost ($179.95), 40-column printer with graphics capabilities for Commodore, Atari and Texas Instruments systems.

Called the Alphacom 42, the unit prints at two lines a second and combines a single-chip microprocessor and an Olivetti print mechanism.

The Alphacom 42 can be linked to most home computers by plugging the appropriate interface cable into the printer's cartridge-like slot.

The printer features upper- and lowercase and a wrap-around facility that allows printing of text lines longer than 40 characters. The Alphacom 42 also recognizes standard ASCII control, or "action," codes for changing the printing mode. Codes include carriage return, line feed, right justification, form feed, graphics control and multiline feed.

Interface cables for the VIC-20 and Commodore-64 are available immediately. Cables for the Atari and TI computers will be available shortly. Prices for the interface cables begin at $29.95. Reader Service number 491.

Three VIC-20 Enhancements

World Electronics (177 27th St., Brooklyn, NY 11232) has announced three products for the Commodore VIC-20: the Universal Parallel Printer Cable (UPA-20), the Universal Cassette Adapter (UCA-20) and the Memory Port Expander.

The UPA-20 is a four-foot-long cable that plugs into the VIC-20's I/O ports. The documentation includes a Basic listing, which allows anything printed to the screen to go to the printer as well, and an assembly listing with four optional modes, including one that adds print and list commands to Basic for parallel output. (The routine is also available on cartridge.) Although it is not designed to fully duplicate Commodore's Serial Graphics Printer, it is intended to fill a neglected spot on the VIC-20 peripheral shelf.

The UCA-20 lets you use any cassette machine with your VIC-20. The UCA-20 plugs into the cassette port of the computer. The other end connects to any cassette machine by use of the MIC and Monitor jacks. Since the standard cassette doesn't have sensors to determine if a button has been pressed, this adapter does not duplicate that function of the Commodore



The Alphacom 42, from Alphacom, Inc., is a low-cost, 40-column printer with graphics capabilities for several popular home computers, including those from Commodore, Atari and Texas Instruments.



The Gavilan, from Gavilan Computer Corp., is a "mobile computer" designed to meet the needs of travellers.

Datassette (the computer will always think one of the buttons has been pressed). The noise filters and amplifiers, however, do allow it to produce a clean signal. In fact, it can successfully load tapes the Datassette never finds. Yet, the output is compatible with the Datassette.

The Memory Port Expander plugs into the memory expansion port of the VIC-20, expanding it to three connectors, each of which has all the address, data and signal lines of the original port. In addition, a row of DIP switches allows the user to disconnect power to any of the connectors, thereby deselecting them.

By limiting the expander to three slots, the need for buffering is eliminated. The board is fused, however, to comply with Commodore's warranty on the VIC-20. The Memory Port Expander board is offered both as a bare board project and as a fully assembled board.

The UPA-20, the UCA-20 and Memory Port Expander cost $19.95 each. Reader Service number 486.

Going Mobile

The Gavilan computer is a self-contained, battery-powered, nine-pound, 16-bit microcomputer system that is designed to offer a complete mobile office in a briefcase.

The computer is contained in an integrated fold-up package. It features an eight-line by 66-character flat LCD display; full typewriter keyboard and ten-key pad; flat touch panel for cursor control and item selection; a 16-bit CPU microprocessor (Intel 8088); a built-in 300-baud direct-connect modem; three-inch microfloppy disk drive and I/O bus; internal memory of 80K (32K available), expandable to 336K; an integrated three-inch microfloppy disk drive with a capacity of 320K (formatted); an interface that permits the computer to connect to any standard full-screen video display; an ac adapter and quick recharger (110 or 220 volts), which plugs into a standard ac outlet; and an optional five-pound printer that prints up to 60,000 characters per battery charge on standard 8½ × 11 paper.

The price of the basic system (main unit, integral microfloppy disk drive, modem, internal processor memory, recharger and Gavilan operating system) will be less than $4000.

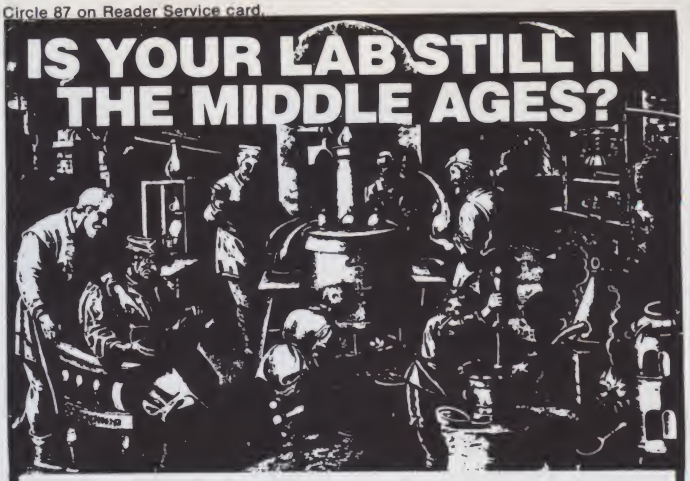
Gavilan Computer Corp., 240 Hacienda Ave., Campbell, CA 95008. Reader Service number 481.

Miniature Printer

The SP-400 is a matrix printer from Syntest (169 Millham St., Marlboro, MA 01752) that is priced at $365. The printer is designed to provide the essential features of more expensive competitors.

The miniature printer provides noiseless 40-column printouts on thermal paper. It

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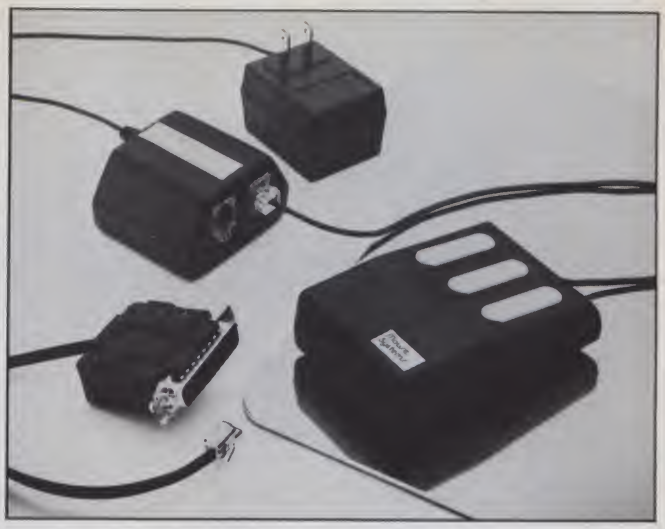
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The SP-400 is a 40-column thermal printer from Syntest Corporation.



The PC Mouse, from Mouse Systems Corp., is designed to let IBM Personal Computer users take advantage of the ease of use provided by a mouse.

has switch-selectable baud rates from 50 to 9600 baud. Stop bits and parity are also selectable. Input is standard RS-232C or 20mA loop. A 40-character buffer is also standard.

The SP-400 is 8 × 4.45 × 2.7 inches. The unit can be rack-mounted. The printer's input is 12 V ac or dc. It also comes with a receptacle-mounted UL-approved 115 V ac 60 Hz power module. The SP-400's printing speed is one line per second. Reader Service number 492.

Hard Disk System

The Hard Disk III is VR Data's (777 Henderson Blvd., Folcroft, PA 19032) latest in its line of Winchester disk drives.

The Hard Disk III's subsystem includes case, power supply, cables and mounting hardware—fully assembled, tested and burned-in.

The unit is available as a five-megabyte (formatted) fixed and/or five-megabyte removable disk cartridge. Other available capacities for the disk drive subsystem are ten-megabyte, two times ten-megabyte, 15-megabyte and two times 15-megabyte. Adapters, which include all hardware and software to run the subsystem, are available for the IBM Personal Computer, IBM-XT, Apple II, Apple IIe, Franklin, TRS-80 Models I and III, LNW-80 and LNW-II.

Prices of the Hard Disk III start at $995. Adapters start at $150. Reader Service number 493.

The PC Gets a Mouse

The Mouse Systems Corp. (2336 H Walsh Ave., Santa Clara, CA 95051) PC Mouse is designed to let IBM Personal Computer users take advantage of the ease of use provided by a mouse.

PC Mouse combines an optical mouse and special software. Up to nine commands may be issued by clicking one of the mouse's three buttons one to three times. The PC Mouse requires only a single RS-232 port. No hardware or software modifications are needed.

PC Mouse works by translating mouse motion and button clicks into user-defined key sequences. Up to 15 key sequences can be assigned to each button code. These key sequences perform exactly as if you had typed them in with the keyboard.

The mouse tracks motion without moving parts by optically counting grid lines printed on an aluminum "mouse pad." An internal microprocessor transmits position data at 1200 baud via a three-wire RJ11C connector. An interface box allows direct connection to an RS-232 port. PC Mouse costs $332. Reader Service number 480.

Commodore Cassette Interface

The VIK-Dubber cassette interface lets VIC-20 and Commodore-64 users save and load data using any standard cassette recorder. The VIK-Dubber circuitry is designed to filter and enhance cassette data, virtually eliminating bad loads.

The VIK-Dubber lets you connect two cassette recorders to make high-quality back-up copies of programs, even machine-language programs. The VIK-Dubber also has an indicator light and quiet audible tone to help you adjust the cassette volume for proper use and monitor the cassette data.

Since it gets its power from the computer, no batteries are needed. The VIK-Dubber costs $34.95, and is available from Bytesize Micro Technology, PO Box 21123, Dept. AZ, Seattle, WA 98111. Reader Service number 489.



The Hard Disk III is VR Data's newest addition to its line of Winchester disk drives.



The VIK-Dubber cassette interface, from Bytesize Micro Technology, lets VIC-20 and Commodore-64 users save and load data using any standard cassette recorder.

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CALENDAR

Toronto Computerfest

Computerfest '83 will be held July 8–10 at Harbourfront in Toronto. The event is sponsored by TRACE (Toronto Region Association of Computer Enthusiasts) and will be the largest non-professional computer show in Canada in 1983.

The show will feature exhibits, a flea market, an auction and numerous talks. For further information, write TRACE, PO Box 6922, Toronto, Ontario, Canada M5W 1X6.

Computers in Music Education—Chicago

On July 10–11, the Chicago Area Music Teachers Association and Triton Community College will host a conference on "The Role of Microcomputers in Music Education."

The show will include an exhibit and many talks and seminars on computer-assisted music education, supporting software, languages and other topics. For more information, call Pearl Anshell, the conference coordinator, at 312-386-7733, or Michael Ferrelli, the director of program development, at Triton College, 312-456-0300.

USENIX Meeting—Toronto

The USENIX Association summer conference, co-sponsored by the Software Tool Users Group, will be held July 12–15 at the Hilton Harbour Castle, Toronto, Ontario. The conference, for academic and business people interested in UNIX, will consist of technical sessions, tutorials and vendor exhibitions.

For more information, call Suzanne McNary at Rogal America, 617-965-1000, or (on technical questions) Mike Tillson, 416-922-1937.

Computers in Education—Oregon

The University of Oregon's College of Education will offer its second annual conference on computers in education on July 20–22 at the Eugene Hilton and Convention Center, Eugene, OR. For details, telephone 503-686-3405.

Business Schools Computer Users Conference

The International Business Schools Computer Users Group (IBSCUG) will hold its 1983 conference July 25–27 at the University of Waterloo, Waterloo, Ontario. The conference is an opportunity for business school people to investigate developments in hardware, software and the application of computers to business and business education.

For information and registration forms, contact Professor Anthony Wensley, Accounting Group, University of Waterloo, Waterloo, Ontario, Canada N2L 3G1; 519-885-1211, Ext. 2755.

Graphics Conference and Show—Detroit

SIGGRAPH '83, the tenth annual Conference on Computer Graphics and Interactive Techniques, will take place July 25–29 in Cobo Hall in Detroit, MI. All aspects of computer graphics technology will be explored.

A public exhibition of artists' computer-generated works will be held in conjunction with the conference. For further information, call Lynn Valastyan or Sheila Hoffmeyer at 312-644-6610.

Music Instruction Workshop—Illinois

The University of Illinois will sponsor its third annual workshop on computer-based music instruction on July 26–29 at the campus in Urbana, IL. The workshop is designed for public school and university music teachers interested in learning about computers.

For registration or other information, write Professor Dale Kimpton, School of Music, University of Illinois, Urbana, IL 61801, or telephone 217-333-2620.

LOGON '83—Montana

LOGON '83, a five-day conference on "Technology, Mythology and Literacy in the New Age" will be held at Montana State University in Bozeman, MT, on August 1–5. The conference will examine the implications of computer technology on human culture and will bring together outstanding people from many fields of work: scientific and technical, educational and artistic, as well as from the media, industry and business.

For more information, contact Michael Sexson, English Department, Montana State University, Bozeman, MT 59717; 406-994-3768.



Microcomputers in Vocational Education—Wisconsin

A conference coordinated by the Vocational Studies Center, University of Wisconsin–Madison, will take place August

10–12 at the Concourse Hotel in Madison. Designed for people concerned with microcomputers and high technology in vocational education, the conference will feature classes, presentations of programs and exhibits.

For more information, contact Judy Rodenstein or Roger Lambert, 964 Educational Sciences Building, 1025 West Johnson St., Madison, WI 53706; 608-263-4367 or 608-263-2704.

IBM PC Faire—San Francisco

Computer Faire announces its first IBM PC Faire, to take place August 26–28 in San Francisco's Civic Auditorium and Brooks Hall. The Faire will focus on hardware, software and applications for the IBM Personal Computer, and will feature a large technical conference, a product exposition and a number of user group meetings.

For more information, contact Jim Warren at 415-851-7077, or write IBM PC Faire, 345 Swett Road, Woodside, CA 94062.

Australian Computer Conference

The tenth Australian Computer Conference is scheduled for September 12–15 in Melbourne, Victoria. The conference will deal in depth with virtually every area of computer application and management.

For details, write Professor A.Y. Montgomery, 10 ACC, PO Box 4063, Mail Exchange Melbourne, Victoria, 3001 Australia; telephone (03) 41 6220.

Peripherals '83—San Francisco

The exhibition Peripherals '83 has been re-scheduled from Boston to San Francisco, and will be held September 13–15 in the Moscone Center.

Information can be obtained from Cahners Exposition Group, Cahners Plaza, 1350 E. Touhy Ave., PO Box 5060, Des Plaines, IL 60018; 312-299-9311.

Federal Computer Conference—DC

The sixth annual Federal Computer Conference will take place September 13–15 in the Washington Convention Center, Washington, DC. In addition to the program of presentations and workshops, there will be a large exposition of ADP equipment, systems and services on the second and third days.

For more information, contact Federal Education Programs, PO Box 368, Wayland, MA 01778; 800-225-5926 from outside Massachusetts; 617-358-5181 from within Massachusetts.

Euromicro 83—Madrid

Euromicro 83, the ninth annual symposium on microprocessing and microprogramming, will take place in Madrid on September 14–16. The purpose is to bring together people from business, industry, government and academia who are interested in the problems and applications of microcomputer systems.

For further details, write Euromicro, T.H. Twente, PO Box 217, 7500 AE Enschede, The Netherlands.

Computer Expo—Indiana

The second annual Indiana Computer Expo will be held at the Indianapolis Convention Center, Indianapolis, Indiana, on September 15th and 16th. The Exposition is particularly designed for business end users of micros and minis, and will deal with software and peripherals as well as basic computer systems.

For more information, call Ernie Kerns & Associates, 317-259-8111.

Deep in the Heart of Texas

The first Heart of Texas Computer Show is scheduled for September 16–18 at the Convention Center in San Antonio. The emphasis of the Show will be on microcomputer-based small business systems.

For further information, contact Robin G. Mann at 512-226-4636, or write Heart of Texas, PO Box 12094, San Antonio, TX 78212.

SICOB—Paris in the Fall

SICOB, the leading French computer exhibition, is scheduled for Sept. 21–30 in the exhibition halls at CNIT, la Defense, Paris. Just preceding this event (Sept. 19–23), the 9th World Computer Congress, IFIP Congress '83, will be held at the Palais de Congrès. The Congress is the annual conference of the International Federation for Information Processing (IFIP), with membership in 42 countries.

For full information on these events, contact Philip H. Dorn, Dorn Computer Consultants, Inc., 25 East 86th St., New York, NY 10028; 212-427-7460.

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REVIEWS

(from p. 146)

While I valiantly struggled to find 15 different word combinations (not all of which were even valid) from the matrix, the computer had the audacity to find 48 of them. It positioned question marks in the proper column and continued to decrement that terrible, terrible clock.

The game is tough enough, but Insoft adds cruel and unusual punishment to the task. It isn't bad enough that I must take a drubbing at the hands of a computer. Wordtrix shows its arrogance by letting me know it has found "enough" four letter words; any more that it finds won't even be counted. Isn't that wonderful?

I'm not even going to talk about the score. 2700 to 650. Really!

Wordtrix exercises the mind. And if you're faint of heart, don't even consider this game. You're going to get downright angry when you find, as I did, that you have difficulty competing at the beginning level. They add to this insult by giving you five *higher* levels of competency. I figure by 1989. . . . But you know, after a while, your eyes begin to cross and you begin to see things that weren't even there in the last game. The matrix appears to be generated randomly, so even the computer can't cheat. But you don't see it pounding its forehead, do you? It doesn't care that you now have one eye pointing north and the other pointing west.

You are being scored at all times as you work against the clock. As the clock ticks down and the neatly defined rows of question marks begin to appear at the right side of the screen, you resolve that this is the last time you will subject yourself to Jeremy Wilson's (the program's author) perverted sense of humor. You swear if you ever meet this guy you'll subject him to a decreasing clock and a matrix of 64 which must be solved in one minute, while working against the Cray-1 supercomputer.

Wordtrix will add one expression to your repertoire: "Oh yeah!" *(Insoft, Inc., 10175 S.W. Barbur Blvd., Suite 202B, Portland, OR 97219.)*

Ken Lord
Winchendon, MA

ZX Disassembler/ Debugger

A versatile Disassembler for the TS-1000 and ZX-81

If you ever bought a "grab bag" and got a real bargain, you know how good I felt when I received Gladstone Electronic's ZX-81 Disassembler/Debugger. It turned out to be much more than I had anticipated. It's not only an excellent disassembler, but is a super hexadecimal machine-code monitor program.

Although it took almost five weeks to receive the cassette, this 4K, all-machine-code program is not only fast, but it's exceptionally accurate.

The versatility of the program is its most impressive feature. The various user commands, as shown in Table 1, give you an idea of the wide range of uses for this program.

Using the Disassembler/Debugger

The program has the automatic run feature, and greets you with an asterisk prompt that tells you it is in the command mode, awaiting your first command. A subsequent equals sign indicates that it is waiting for the input of the appropriate address. All addresses, codes and indicators are handled in hexadecimal. This makes it easier to work with the major manuals on the Z-80 MPU.

An input of the D command and a starting address will result in one disassembled instruction each time the enter key is pressed. The mnemonics are all standard Zilog, with the exception of 16, which are mainly Intel 8080. A reference list is provided as a part of the four-page instruction sheet. I used the disassembler for a listing of the first page of the 8K ROM, and the instructions and associated addresses matched my printed copy perfectly.

The HL register is always printed as "M" in the mnemonics, and the address in hex precedes each disassembled instruction. The ZX-81 graphics character is added beside the object of each load instruction. This is a nice feature when working with graphics.

The part of the program that will be the most useful in your actual programming is the monitor portion. The monitor contains an excellent hex loader and will, on command, list any area of memory in chunks of eight instructions per line.

Each new line is labeled with its starting address, and the enter key has to be pressed for each new line. It is possible to view memory contents as the ZX-81 character, rather than in hex; however, I've yet to find a good use for this mode.

There are various capabilities, such as block move and block fill, that you will find useful when programming. However, the best capability will, no doubt, be the single-step, machine-code execution mode. In this mode, you set a breakpoint in your code. When this point is reached, the execution will switch to single-step.

All registers, flags, mnemonics and the next instruction are displayed at the bottom of the screen. You then single-step the code, and watch the changing register contents as your program executes. You even can modify your register contents as the program is single-stepped, or even skip sections of the program (such as loops) that you know to be correct. The possibilities of debugging your program are endless.

A — Displays memory contents as the ZX-81 characters
B — Sets a breakpoint and starts execution of the machine code program
C — Compares two designated blocks of memory
D — Disassembles a specified area of memory
E — Loads machine code in hexadecimal
F — Fills a block of memory with specified character
G — Executes a machine code program
M — Moves a block of memory to another designated address
N — Executes next specified instruction in single-step mode
O — Displays only mnemonic in single step mode
Q — Returns ZX-DB to command mode
R — Executes the CALL and returns to single-step mode
S — Searches memory for a specified string
V — Displays memory in hexadecimal
W — Sets aside a portion of the screen for program display
Z — Presets specified register with desired contents while in single-step

Table 1. Command list for ZX Disassembler/Debugger

Disadvantages

There are several complications with the use of ZX-DB. The program was difficult to load. The volume and tone controls had to be set and reset. Loading took several tries before a perfect load was achieved. I adjusted the playback azimuth on my recorder, and the problem cleared up completely. Now, the program records on the first try.

ZX-DB is located in a long REM statement in the first 4K of memory. This makes it susceptible to wipe-out. I experimented a lot, and mine usually crashed. This means reloading the code and the monitor again.

Listings of code and instructions in all modes have to be preceded by pressing the enter key. This is not distracting except when you are trying to use both hands for other things, such as writing. A slow-step feature would have been nice.

ZX Disassembler/Debugger, for the price, is an excellent program. It is written by Bug Byte, and is a companion program to their ZX Assembler, which also is distributed by Gladstone Electronics. The company seems to be having difficulty in keeping these two programs in

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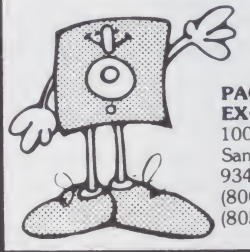
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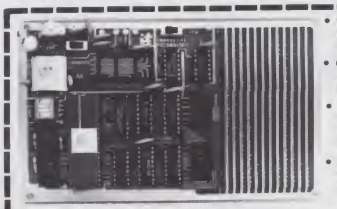
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stock, however. I now have a back order on the assembler. *(Gladstone Electronics, 901 Fuhrmann, Buffalo, NY 14203; $9.95.)*

Jim Stephens
Nashville, TN

HexPrintR

WordStar is a Classic, but HexPrintR Can make it even better

Not many application programs have achieved the reputation of being a classic, but WordStar has. Considered to be the top performer in word processing, it has become the standard to which all the others are compared. Being number one, however, doesn't mean perfection. There's room for improvement in WordStar.

It's no mean feat to tweak the giant and make him more mellow instead of cranky, but HexPrintR has managed to do it.

WordStar's Weakness

Before explaining how HexPrintR enhances WordStar, let me point out a deficiency that it corrects. One of WordStar's weaknesses is that it doesn't utilize all the capabilities of a modern printer. Dot matrix printers provide a varied selection of type fonts, special characters and international character sets. For example, the Epson MX-100 has, in addition to the normal print mode, a condensed mode, an expanded mode, an enhanced mode, a double-strike mode and even combinations of these modes—such as condensed expanded or enhanced double-strike modes. WordStar doesn't give you the ability to combine these modes. This printer also provides access to foreign language characters used in France, Germany, England, Denmark, Sweden, Italy and Spain; none of these can be utilized from within WordStar.

WordStar mimics these modes by allowing you to print in a boldface or double-strike method, whereby the printhead will make two or three passes for each line of print, but this is not quite the same as the double strike Epson offers.

When the Epson printer is directed to double strike, the printhead makes two passes for each letter; in addition, the paper is moved vertically a fraction of an inch between each strike, helping to fill in the spaces between the dots.

For the enhanced mode, the Epson printer will offset the dot pattern horizontally to give each character a fuller appearance, approximating the quality of print produced by a daisy wheel printer. A combination of enhanced and double-strike modes produces a *very* bold type.

There is a way to print out a WordStar file in one of the above modes, but it's awkward. To give the proper commands to the printer, you have to leave WordStar and call up Basic or an assembly-language routine. You then must return to WordStar to print the file.

If the disk doesn't have enough room for both of the WordStar programs and the Basic program, you have to remove the WordStar disk, insert the Basic disk and return to the WordStar disk. If you turned the printer off during this procedure or between printing different files, you would have to repeat the process again. This method doesn't allow you to intermix the different modes in the same text, unless you stop to give the printer the proper commands each time you switch modes. HexPrintR eliminates all that.

The Install program, provided with WordStar, lets you make modifications in the printer patch area to support optional printer features, but these are limited and don't always work.

The Purpose of HexPrintR

HexPrintR is a program modification to WordStar which allows you to take advantage of the full capabilities of your printer. With HexPrintR, all the commands to carry out the different print modes or functions are written in the text of the WordStar file itself.

There is no need to exit from WordStar, change disks or call up another program. All you do is enclose the printer codes between a pair of control R's in the text wherever you wish to have that particular print feature turned on.

The manual gives detailed instructions on how to use HexPrintR, and contains examples of practical applications.

Installing HexPrintR

Modifying your WordStar disk to allow full printer control by HexPrintR is simple. A CP/M-based system is necessary, and you will need the CP/M transient files Submit.com, XSub.com and DDT.com, which are supplied with the CP/M operating system. Put the HexPrintR disk, with the previously mentioned CP/M files copied onto it, into drive A. Put the WordStar disk in Drive B.

Step one, type ↑C. Step two, type SUBMIT HPR226 if you have WS version 2.26, or if you have WS version 3.0, type SUBMIT HPR30. Step three, wait until you see the message ***INSTALLATION COMPLETE*** on the screen.

That's it. The disk in drive B now is "Hexed WordStar" and is ready for use. Each time you call up WordStar from this disk, the printer installation message that appears on the screen as the program is loading will indicate that HexPrintR has been installed.

If you don't care to do it yourself, C.I. Software will install HexPrintR for an additional charge of $6. You must send them a copy of your WordStar disk for this installation service.

HexPrintR doesn't leave you in the dark if you made a mistake. If you direct HexPrintR to do something that it does not understand, an error message will appear on your printed document. The message will look like this: . . . HPR ERR n It will appear in your text at the point of the error. The "n" is the error number. It will give you an indication of what to look for in your file.

Designing Your Own Special Characters

Here's where HexPrintR really shines. This feature lets you create characters not provided by the printer, or invent characters and symbols of your own design. The printer must have individually addressable dot graphics capability to accomplish this.

Epson calls this feature "Graftrax," and it's invoked by turning on the Bit Image mode. In this mode, each of eight needles in the printhead can be controlled freely and programmably. By choosing your printer's decimal or hexadecimal code for any of the 32 possible combinations of the eight needles, you may create any design or symbol desired. For instance, the Epson has no copyright symbol, but I was able to design one by choosing the appropriate dot pattern codes and inserting them in the text between a pair of ↑R's.

This is what the hexadecimal notation for the copyright symbol looks like:

↑R1b,4b,08,00,3c,42,99,a5,a5,81,
42,3c↑R

Choosing the proper codes takes a little time, but once a character or symbol has been designed, the code can be saved in a library file and copied into the text by WordStar's block command, ↑KR, "Read file".

The design of a new symbol can be more easily carried out if you draw the dot pattern on graph paper first, then convert the drawing into hexadecimal data.

The HexPrintR manual explains this procedure in detail and even provides blank grid forms to generate your own special characters. If your work demands special mathematical or scientific symbols, HexPrintR will provide a way for you to create them.

I've also found it helpful to create small versions of numerical characters to use as notations for superscripted footnotes. The Epson printer cannot roll the carriage up and then down again for superscript, so I created a set of numbers—from zero to nine—that are smaller than the normal characters.

The top of the number does not extend above the top of the printed line, as real superscript does, but the bottom of the number does not reach the bottom of the printed line, giving the number the appearance of superscript.

Graphics

Graphics capability is not limited to creating characters or symbols; it can be used to draw any kind of picture, chart or

graph. Bear in mind, however, that the amount of data necessary to generate an image is directly proportional to the size and complexity of the image.

HexPrintR and WordStar files can accommodate a large amount of data, but the limiting factor becomes the amount of time spent in deriving the hexadecimal code for a large image. The use of graphics in this context should be reserved for designs that will not be used just one time, but repeatedly.

One use that I have found for this function is to print a monogrammed letterhead of my own design. The letterhead also takes advantage of the ability to mix both graphics and text modes on the same line.

If you have the time and inclination, you can create larger and more complex designs.

HexPrintR provides WordStar users with easy access to all the controls and features incorporated into the printer by the manufacturer. HexPrintR eliminates the extra steps that normally would be required to achieve full printer control of text created with WordStar.

A bonus for owners of printers with dot-addressable graphics is that it makes this feature easy to use. Normally, it takes a fair degree of technical knowledge and a lot of repetitive typing on the keys to utilize the printer's bit image mode. A Basic statement such as the following:

```
LPRINT CHR$(27);"D";CHR$(9);CHR$(17);
CHR$(25);CHR$(33);CHR$(0)
```

can be written in a WordStar text file in a much shorter version:

```
^R27N^RD^R9,17,25,33,0^R
```

Use of the bit image mode can provide a means of creating characters and symbols that the printer just doesn't have. It's certainly much neater than using a pen to fill in the missing characters.

The insertion of created characters into the text is awkward; however, it can be overcome with a little diligence.

WordStar doesn't recognize that the string of hex data between the pair of ^R's may take up only one or two spaces when printed. It prints the character formed by the data, but then prints a space for each of the numbers between the commas. Any text that follows will be separated from the formed character by all those spaces, even though no spacing was intended. As explained in the manual, this can be avoided by writing the text and inserting a "dummy" character where you wish the formed character to appear.

After all corrections and formatting of the text are completed, replace the dummy character with the string of data by means of the find and replace commands. The formatting and spacing that were present before the replacement will be retained.

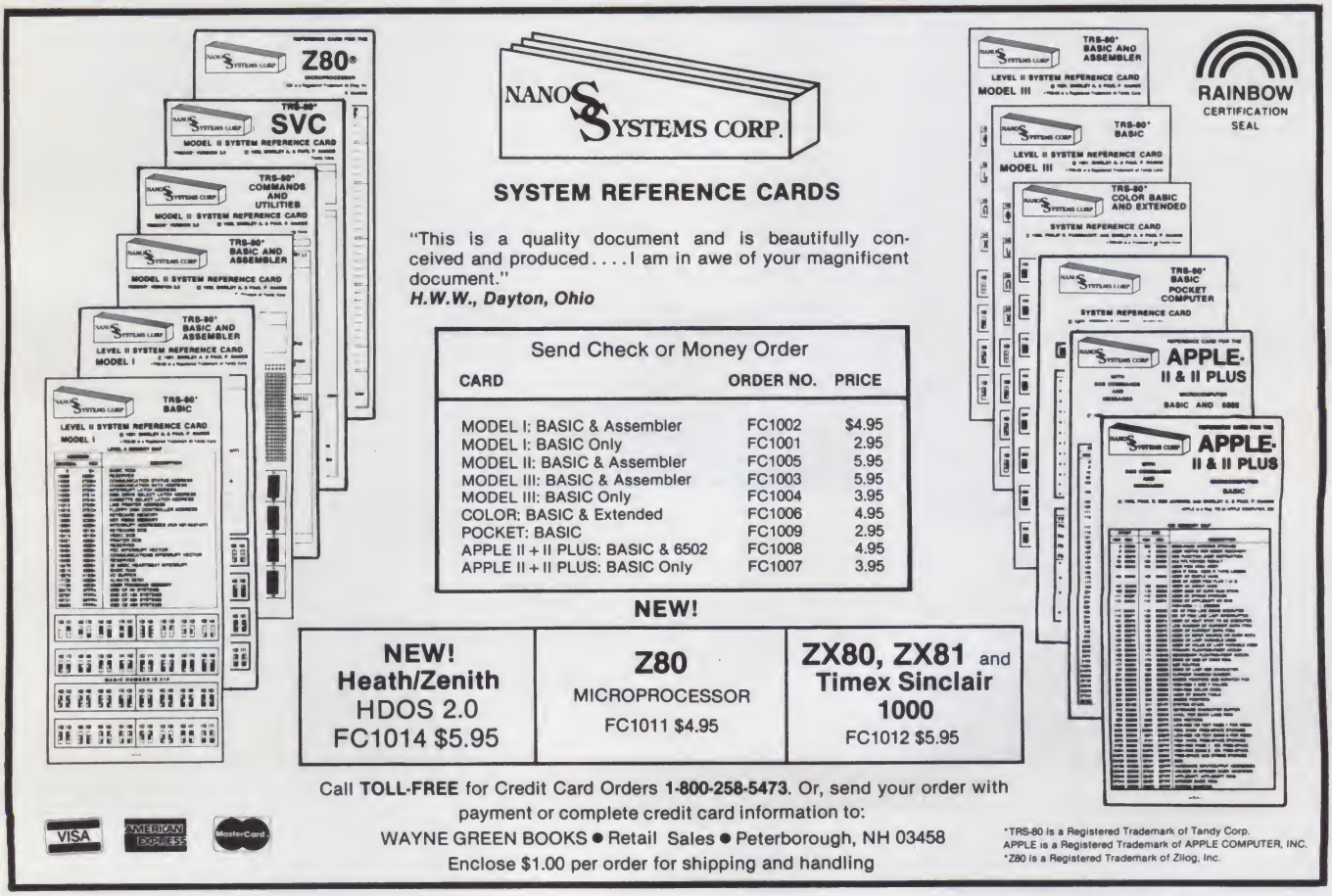
Custom Installation

If you don't have a printer with dot graphics capability, or if you don't have a need to use this feature, C.I. Software also provides a customization installation of WordStar for particular printers. The cost is less than HexPrintR's.

The custom installation gives you access to almost all your printer control codes from within the WordStar file. This will allow you to select all of the various type styles and combinations, but on some printers all the formatting features cannot be accessed. Bit image graphics is not supported with this package. Custom installation is available for several popular printers. C.I. Software is continually adding printers to their list, so contact them for the latest information.

HexPrintR costs $39 for 5¼-inch disk and $42 for eight-inch disk formats. Custom installation costs $25. If you purchase custom installation and HexPrintR at the same time, there is a combination price of $55. These modifications give you one of the most refined and powerful sets of printer control codes available today. *(C.I. Software, Suite E 149, 1380 Garnet Ave., San Diego, CA 92109.)*

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The DOS Enhancer

Increase the speed Of your Apple's DOS With this tricky program

Apple DOS has its faults and its alleged faults. Naturally, several companies have come up with attempts to fix these shortcomings. One of these companies is S & H Software (58 Van Orten Road, Harrington Park, NJ 07640).

S & H Software has produced The DOS Enhancer (TDE), a program designed to cure some of the faults of Apple DOS, and to perform a number of other interesting tricks—all for $69.95.

First of all, TDE is a "fast" DOS. It can do disk loads and saves in up to 1/5 the time that Apple DOS takes. This means that a disk load that ordinarily takes two minutes could, in some cases, be done in less than 25 seconds.

TDE also can detect the presence or absence of either integer Basic or Applesoft Basic in a particular machine. It then can load the missing Basic, or print "error" messages to alert the user to the missing language.

As part of this ability to detect the presence or absence of specific Basic dialects, TDE can create disks with multiple greeting programs that will boot successfully whatever the dialect—or for that matter, will boot with binary or Exec files.

TDE can create a customized catalog (Supercat/Menu) that also serves as a file selection menu. Files can be loaded or saved, various DOS commands can be executed, free storage space on the disk can be determined, and so on—all of this with single keystrokes.

As an "unadvertised special," TDE includes a number of minimally supported, and possibly not fully debugged, routines. In general, these routines help users work on and repair disks at the individual byte level. Obviously, at this level you better be a serious programmer and know exactly what you're doing.

There are other features in TDE, but the ones I've mentioned are the major ones. They seem to work as advertised. Disk loads and saves can be done more quickly; Applesoft and integer Basic are properly detected; and the customized Supercat/Menu catalog was a delight to use, even though the numerous options tend to be confusing.

As you study the functions of TDE, you realize that it is a specialized product. Its major users will be commercial vendors preparing disks for sale to Apple owners who have varying configurations on their machines.

Everyday hackers usually don't worry about how fast their homebrew programs are delivered to and from the disk drives. The time is usually less than 60 seconds, two minutes at the most.

Everyday hackers don't need a routine to detect integer and Applesoft Basic in their own machines; they already know, or maybe have a language card with the missing dialect built-in.

Also, most everyday hackers will find Disk Access Utility routines confusing. They require a thorough knowledge of how data is formatted on disks. (I knew my Basic programs as I looked at an ASCII representation of the disk sectors, but I was bewildered by all the peculiar symbols that had been added to them.)

The Supercat/Menu-enhanced-catalog feature is nice for hackers, but $70 is a lot to pay for this one feature.

Still, all of these features can be attractive to commercial programmers. Many users are irritated by slow disk drive access, even if the delays are only a couple of minutes. They are likely to blame the commercial program, not the disk drive.

And while many users will have both integer and Applesoft Basic available through a language card, TDE's flexibility in dealing with both dialects could give commercial vendors low-cost protection.

Again, naive users with just one dialect in their machines might blame the program, not the machine—unless they get an error message that explains the problem in English, not Computerese.

So if you're just an everyday hacker who writes an occasional Basic program for your own amusement, TDE is not for you. But if you're a serious commercial programmer looking for wide sales, the package might be worth your inspection.

And while you probably could write most of the routines yourself, you probably would spend more than $70 worth of your time on the project. And after all, in commerce, it's not DOS enhancement that counts, it's dollar enhancement.

Brownlee Elliot
Bloomfield Hills, MI

Wordtrix

This IBM game will Exercise your mind and Increase your blood pressure

Wordtrix is another one of Insoft's invitations to mental madness. Oh, it seems simple enough. A matrix of 16 letters appears on the screen, and all you have to do is assemble three, four, five or six letter words from the matrix.

It's not that easy. The letters must touch. I can move from left or right, from top or bottom, around in a circle, but the computer is going to do so, too, checking its finds against an internal dictionary. And I have only three minutes! Gadzooks!

If there were time to do a leisurely analysis of the graph, it wouldn't be so bad. But Insoft has cruelly placed a clock right at eye level. And every time the computer finds a word in its dictionary, as if to say "nyea, nyea," it positions the word in the form of question marks under the appropriate column.

(Continued on p. 142)

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